West Virginia Geological
Morgantown, W. Va.

THE IRON AGE

Seventy-fifth Year

APRIL 3, 1930

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SPECIAL ANALYSIS
STEELS FOR IMMEDIATE
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BECKER OVENS FOR WEIRTON

The Weirton Steel Company has contracted with The Koppers Construction Company for the design and construction of an addition to its by-product coke plant at Weirton + + + This installation will include 25 Becker Type Ovens arranged for blast furnace gas underfiring, together with the necessary extensions to coke plant auxiliaries + + + With this addition, which is its third Becker Oven installation, Weirton will have 111 ovens with an annual coal carbonizing capacity of over one million tons.

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CONSTRUCTION COMPANY
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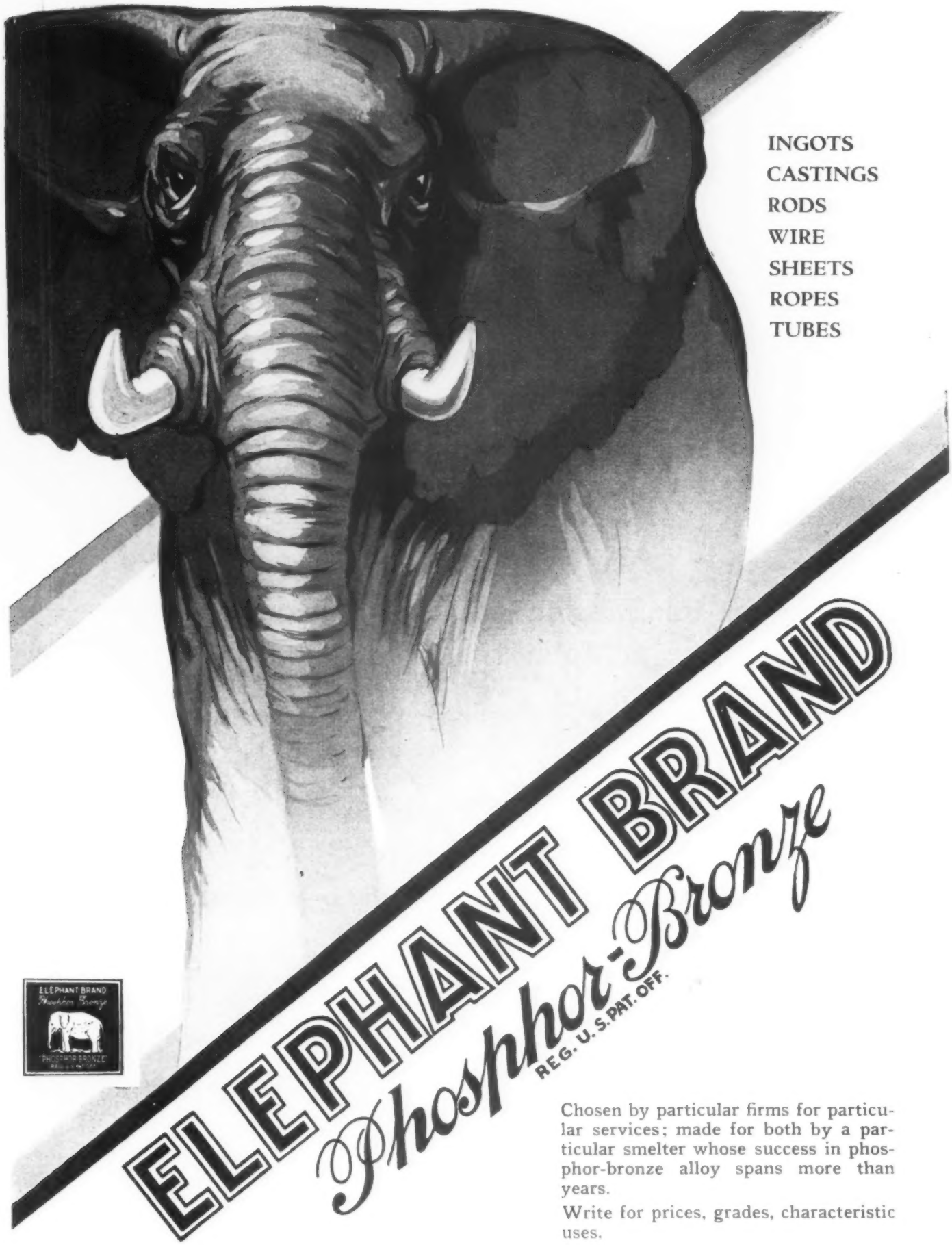
THE IRON AGE, published weekly by the IRON AGE PUBLISHING CO., at 239 W. 39th St., New York, N. Y., U. S. A. Entered as second class matter June [illegible] at the Post Office at New York under the Act of March 3, 1879. $6.00 a year in U. S., Canada $8.50, Foreign $12.00. April 3, 1930. Vol. 125, No. 14.



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THE IRON AGE

Seventy-fifth Year

APRIL 3, 1930

WHEELOCK, LOVEJOY & CO., INC.

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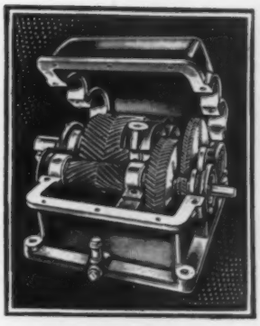

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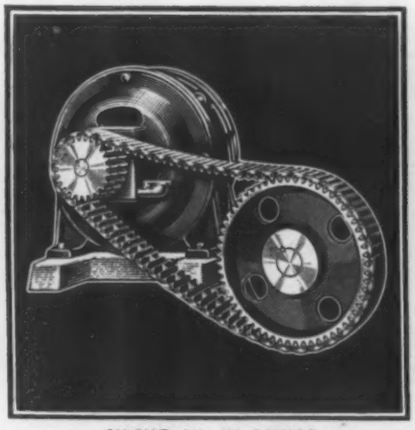

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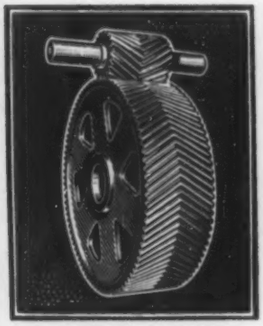

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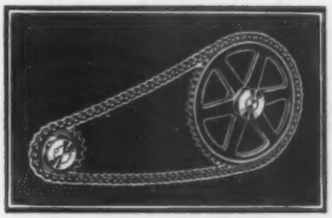

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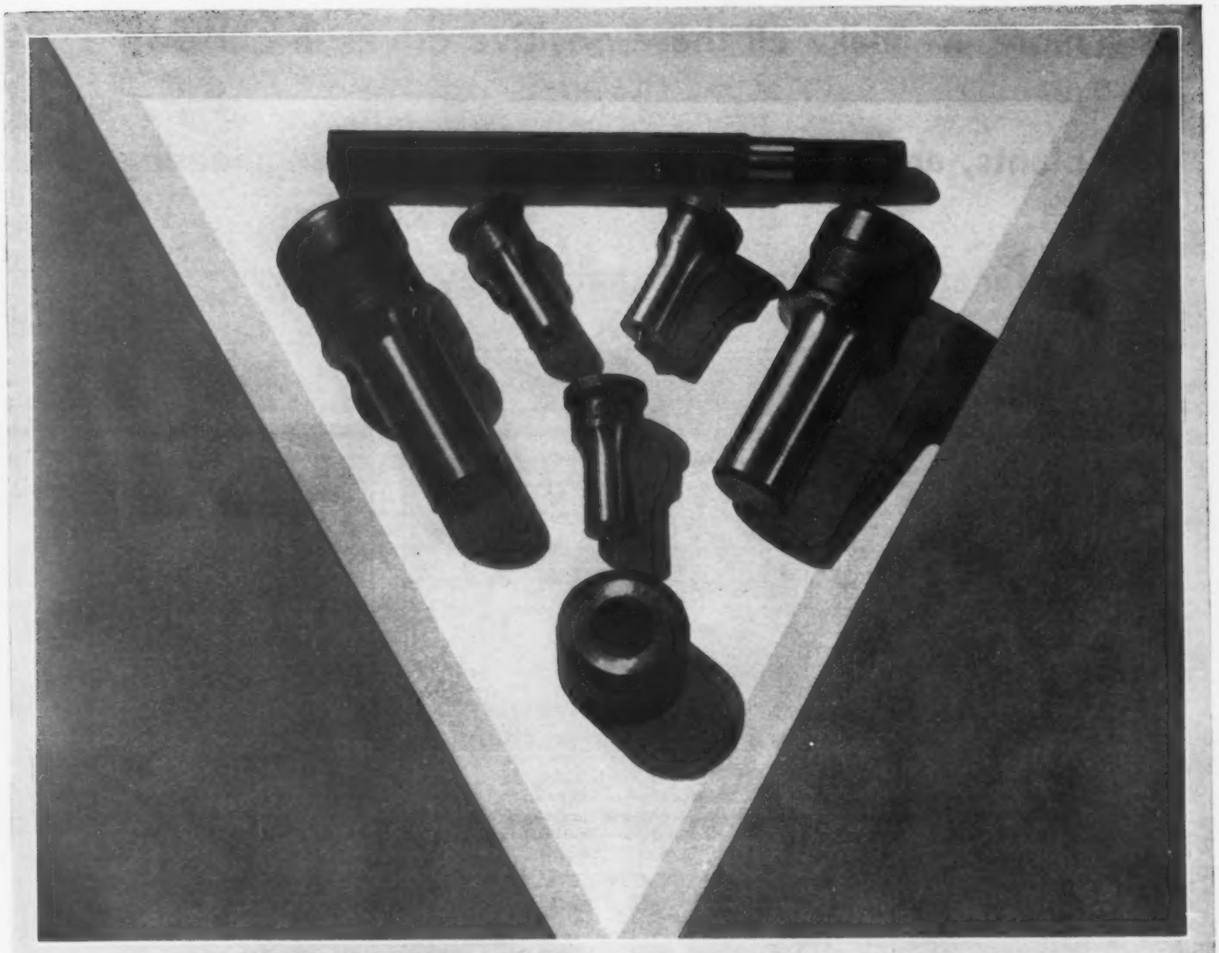

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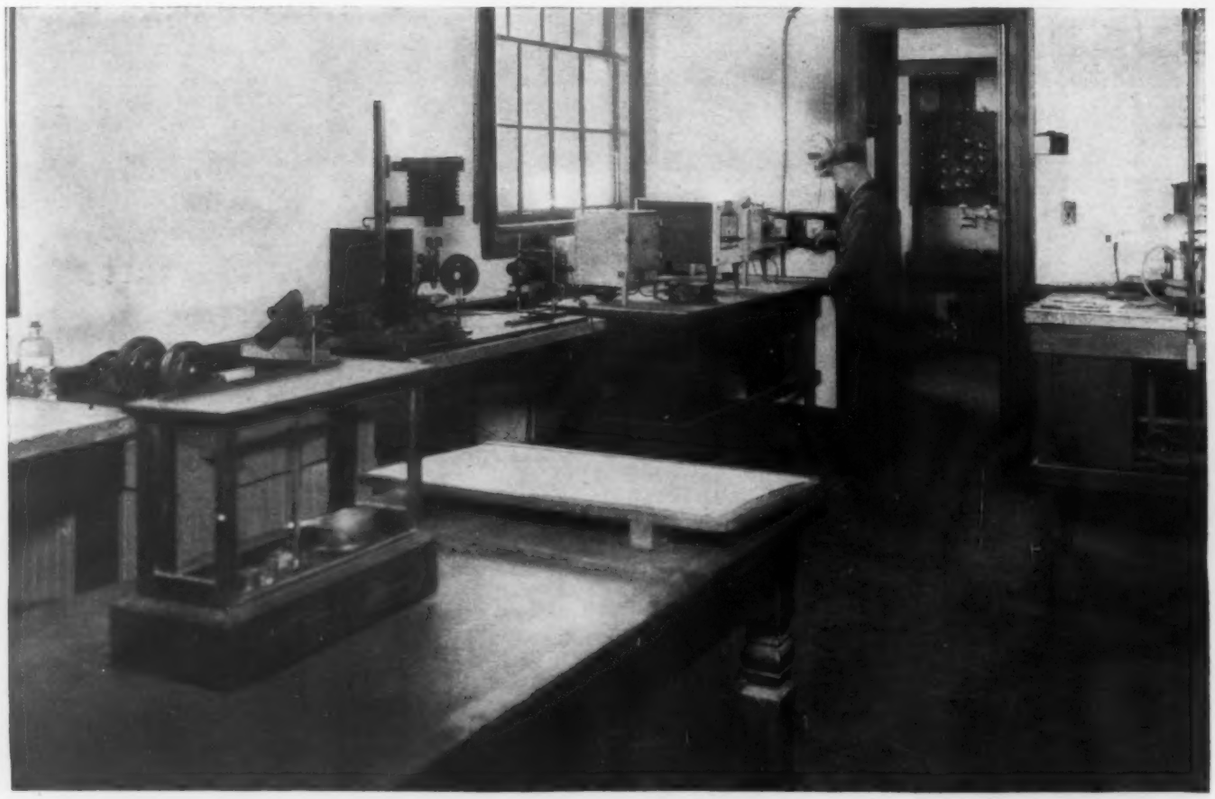
Combined Research



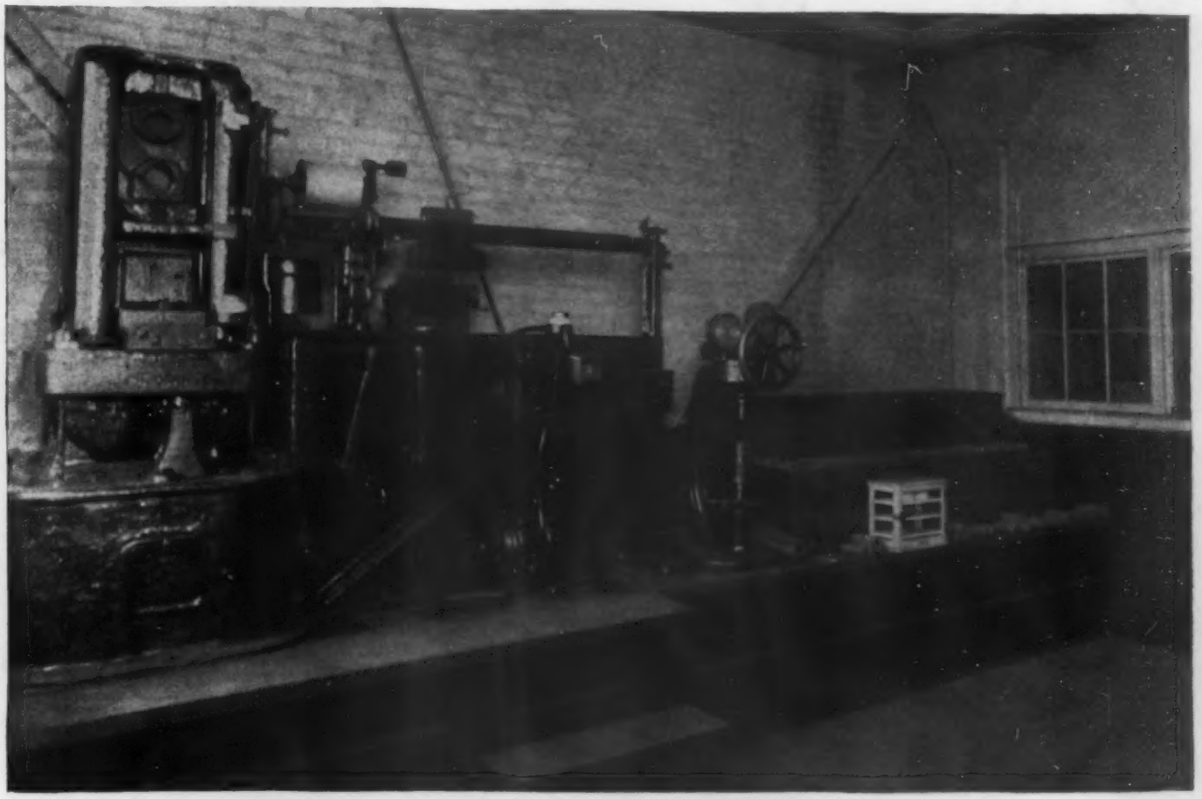
Exploring the Unknown

The large alloy casting business of both Sivyer and Nugent was developed by diligent exploration of the unknown quantities in steels and alloys. To this great adventure in metallurgy, both foundries have dedicated extensive laboratories. These now join forces: not only to seek new and better casting metals for you but more definitely to establish the practical properties of the steels and alloys which you meet in everyday service. The combined research laboratory is easily the largest of its kind.

SIVYER

Milwaukee SIVYER STEEL

Laboratory Control



Mere melting of metal and pouring it into waiting molds form no assurance of the perfect steel and alloy steel castings modern machinery and equipment demand. Recognizing this fact, Sivyer and Nugent long ago began to build the extensive laboratory controls that operate their foundries today. These controls are really a scientific intelligence that literally guides each casting through the entire gamut of foundry operations and departments—from pig and scrap bins to the shipping floor.

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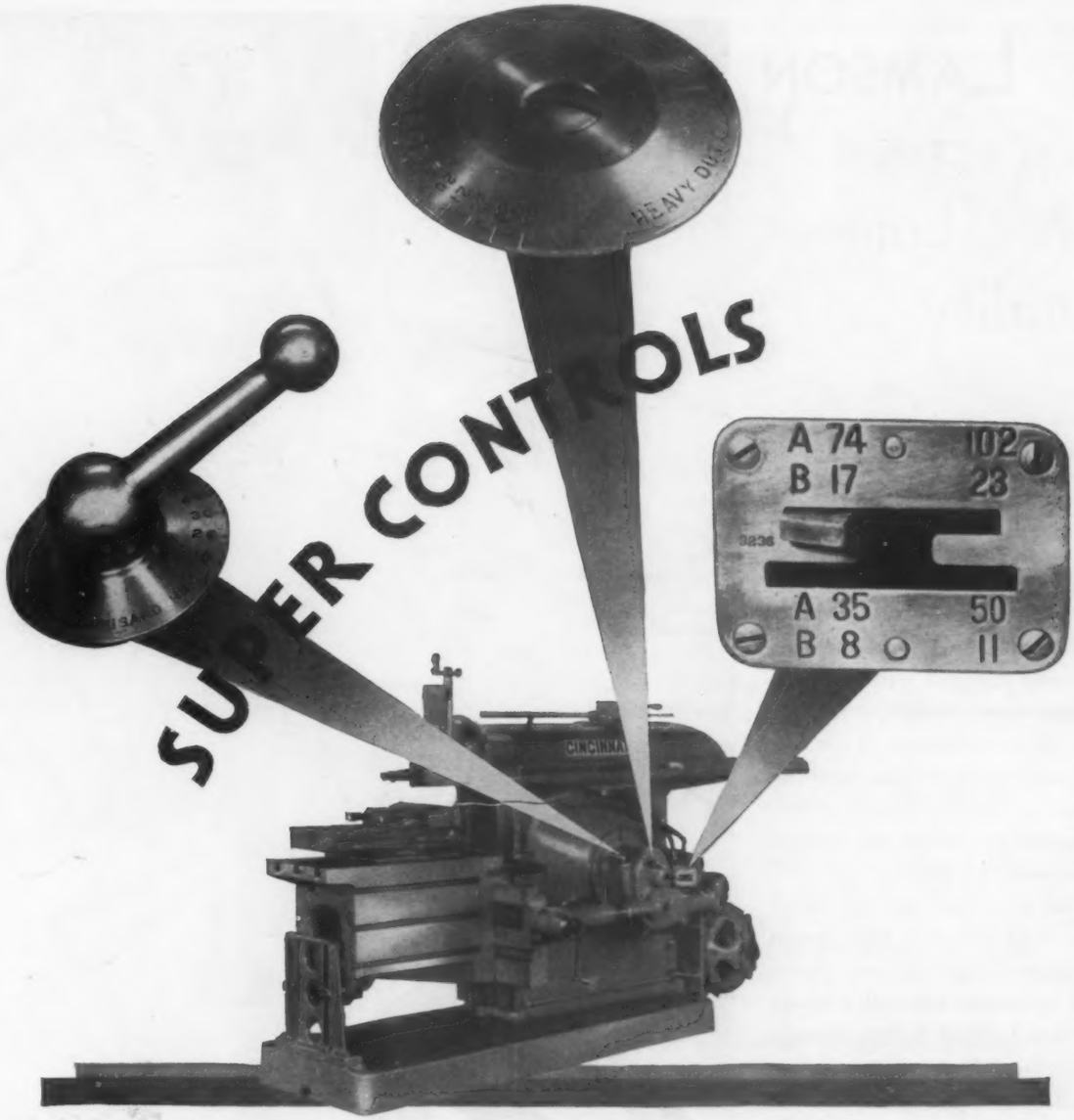

● A shaper is as fast as its controls. If the operator must walk to the rear of the shaper to change the speed or if the ram must be stopped to change the length of stroke or the direction of feed—the shaper is slow.

● The controls on Cincinnati Shapers are fast, a twist of the wrist or a touch of a lever and adjustments are made. The feed, speed, and length of stroke can be changed with the ram in motion and they are all within easy reach from the operating position.

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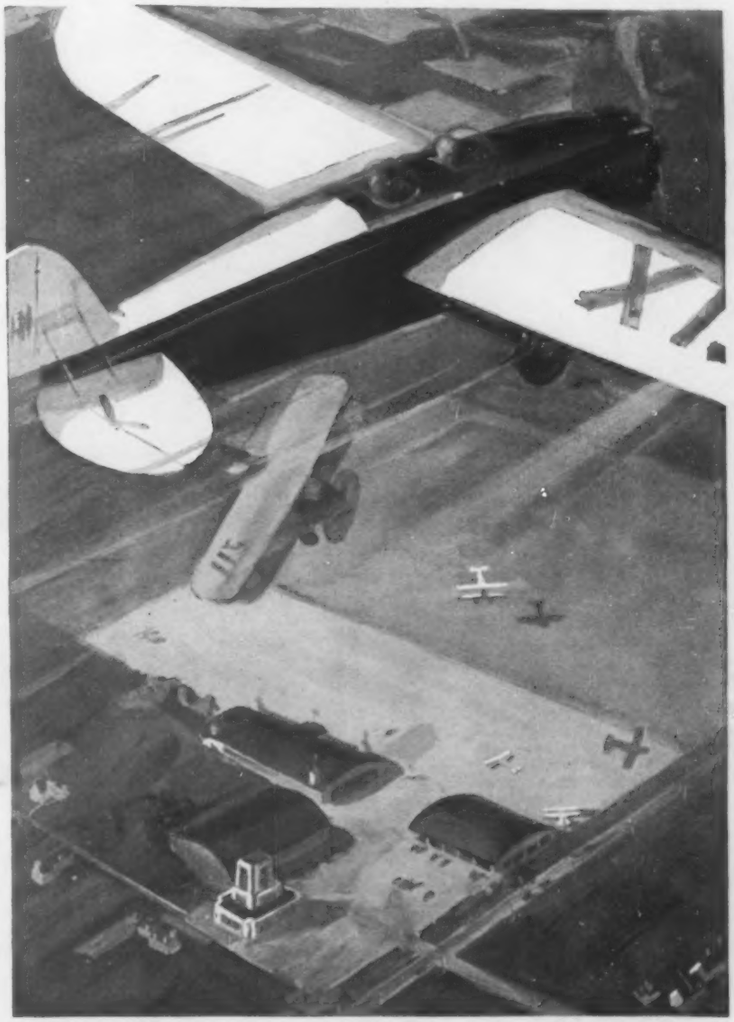
WHAT STRAINS A PLANE MUST STAND!



BUMPY air and a high wind . . . breathtaking speed on a sharp turn . . . a loop, a zoom, a sideslip —and struts and guywires and braces groan. What terrific strains the wings, the fuselage and the motor of a plane must stand!

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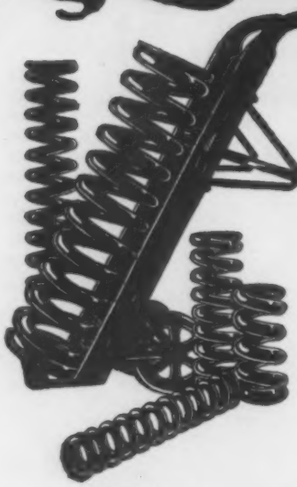

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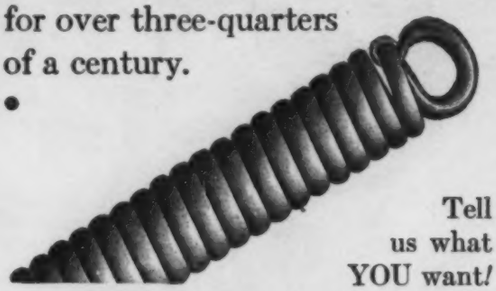

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AMFORGE

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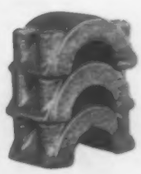

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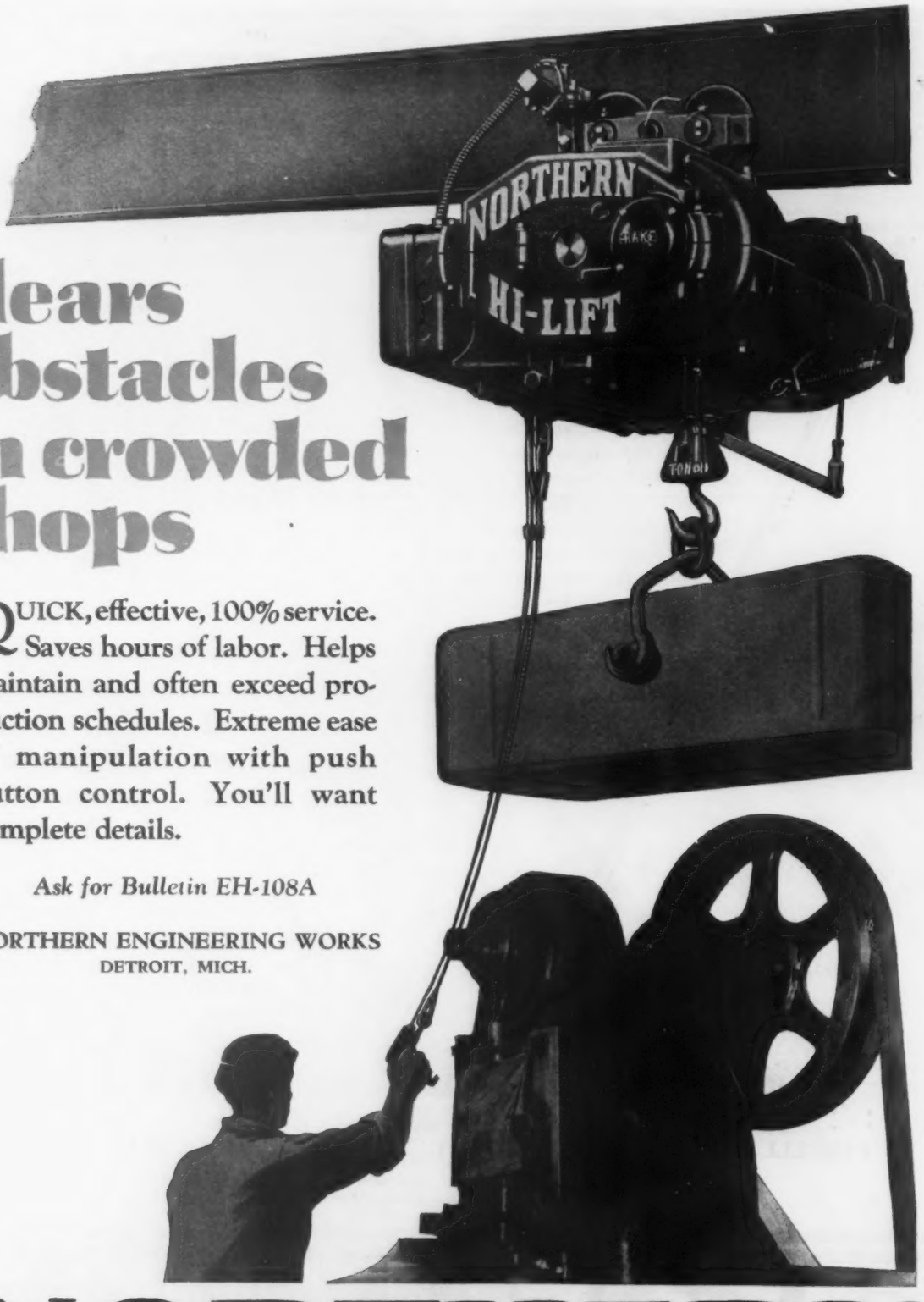


clears obstacles in crowded shops

QUICK, effective, 100% service. Saves hours of labor. Helps maintain and often exceed production schedules. Extreme ease of manipulation with push button control. You'll want complete details.

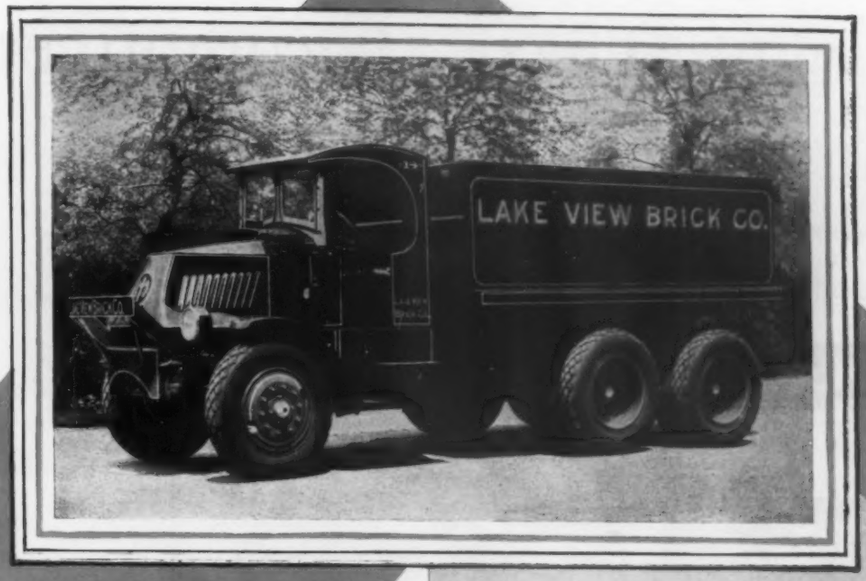
Ask for Bulletin EH-108A

NORTHERN ENGINEERING WORKS
DETROIT, MICH.

NORTHERN
ROLLER BEARING HOISTS

I.A.-4

LIBRARY
WEST VIRGINIA UNIVERSITY



Body of Inland Copper Alloy Steel Sheets.

THE BEST RUST-RESISTING SHEETS HAVE THE *LOWEST* FIRST COST

Buying rust and corrosion-resisting sheets differs in one respect from buying other materials. Copper-bearing steel sheets . . . those which last the longest . . . are also the cheapest, costing less than any other rust or corrosion-resisting sheets and only slightly more than ordinary sheets.

That copper-bearing steel sheets last longer than ordinary steel sheets and considerably longer than other sheets in the rust-resistant class is proved by the findings of the American Society for Testing Materials. The U. S. Bureau of Standards, too, finds that copper adds more to the life of steel sheets than the purity of iron or steel.

Inland Copper-Alloy Steel Sheets save when you buy them . . . save by pushing back the replacement date. They are available in various grades and finishes and in all standard gages for a multitude of applications. They are produced by Inland Experience, under Inland Inspection and are always promptly available.

Write for the new booklet, "Inland Open-Hearth Sheet Steel Products" which describes Inland Copper-Alloy and the many other Inland Steel Sheets.

Save with Steel

INLAND Copper-Alloy STEEL

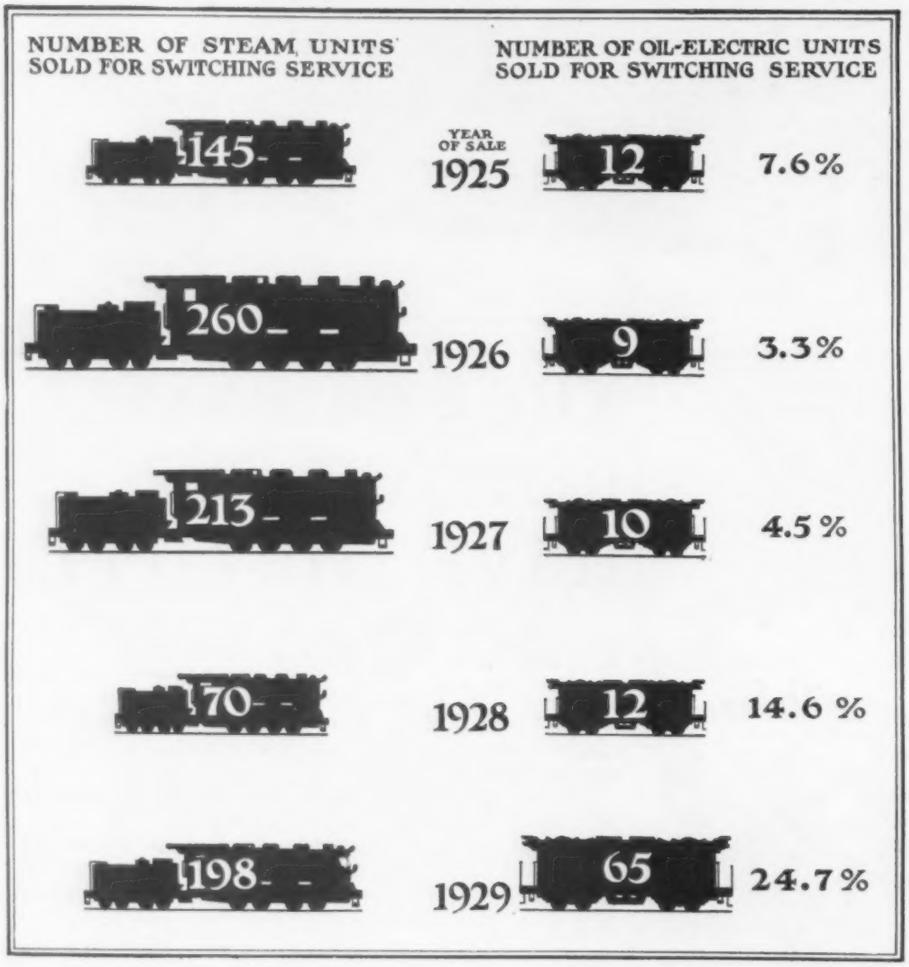
INLAND STEEL COMPANY

ABLE SERVANT OF THE CENTRAL WEST

38 SOUTH DEARBORN STREET, CHICAGO

Sheets Bars Plates Structurals Rails Track Accessories Rivets Billets

Growth of Oil-Electric Locomotives in Switching Service



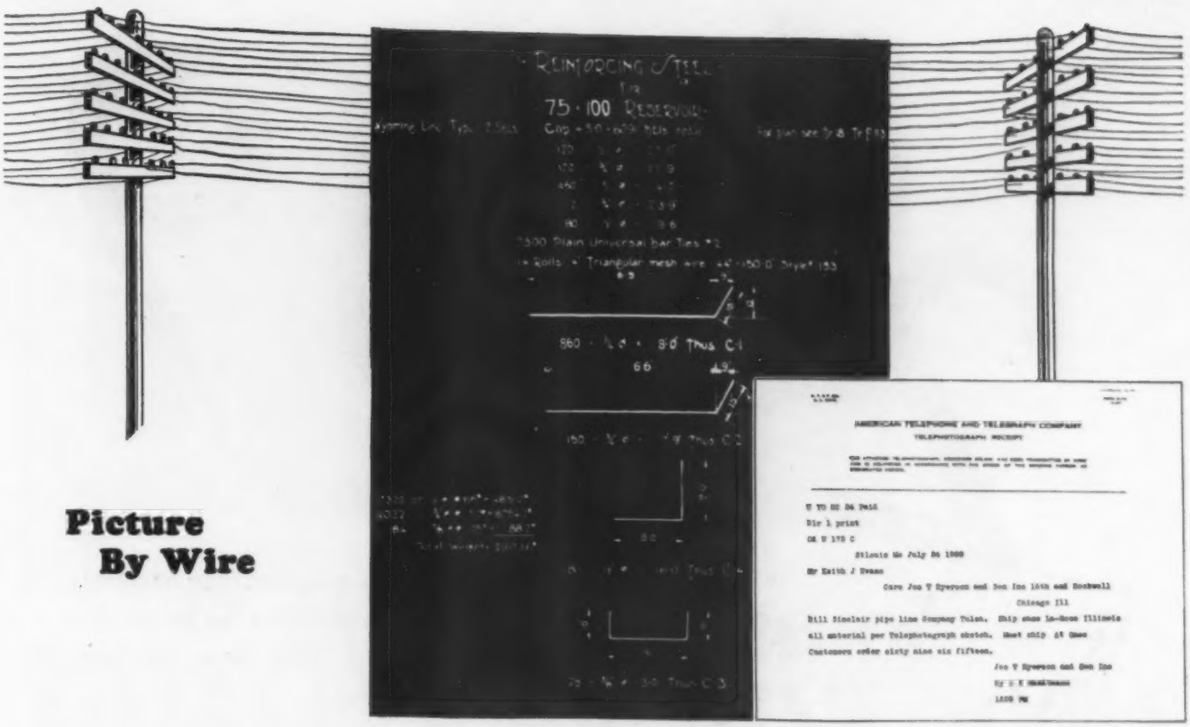
Figures taken from January 1st issue of "Railway Age"

In switching service, the I-R oil-electric locomotive is more economical, is more efficient, and has a greater availability than any other type of prime mover.

INGERSOLL-RAND COMPANY - 11 Broadway - New York City
Branches or distributors in principal cities the world over
For Canada refer—Canadian Ingersoll-Rand Co., Limited, 10 Phillips Square, Montreal, Quebec

16-OEL

Ingersoll-Rand



Picture By Wire

Telephotograph Speeds Ryerson Steel-Service

It was 3:30 p. m. when the special messenger rushed into the Chicago plant with the above telephotographic order.

The order placed with our Tulsa, Okla., representative called for 1890 reinforcing bars requiring 1100 bends; 7300 bar ties, and 14 rolls of wire mesh, urgently needed on a job at La Rose, Ill.

The standard time charts showed 3.1 hours of shearing time and 3.5 hours of bending, but crews doubled up and in one hour twenty-five minutes the material was ready. In the meantime the Traffic Department had lined up a car and in another thirty minutes the reinforcing was moving out of the plant. The material reached La Rose at 4:30 the next morning.

It is not often that this kind of service is necessary, but whenever you need steel products in a hurry you can depend upon Ryerson to go the limit and get the material to you in the shortest possible time.

Bars	Sheet, Blk. and Galv.	Turned, ground and	Boiler Tubes	Babbitt Metal	Concrete Reinforcing
Structurals	Sheets, Full Finished	Polished Shafting	and Fittings	Tool Steel	Firmtread Plates
Rails	Refined Iron	Strip Steel	Welding Rod	Alloy Steel	Small Tools
Plates	Screw Stock	Rivets and Bolts	Forging Bars	Allegheny Metal	Machinery, etc.

Write for the Ryerson Journal and Stock List, the "key" to Immediate Steel.

JOSEPH T. RYERSON & SON INC.

Plants: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City
Representation in: Minneapolis, Tulsa, Houston, Newark, New York, Denver, Los Angeles, San Francisco

RYERSON
STEEL-SERVICE

2109

2109 Stuebing Lift Trucks—an average of nearly 211 each—is a sufficient number to prove that Stuebing is no experiment with these ten leading industrial organizations.

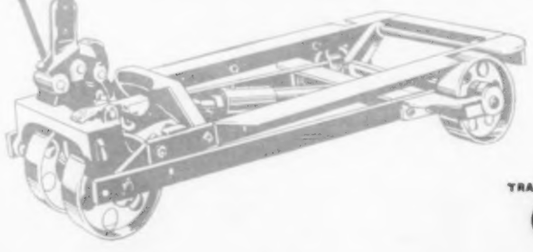
Here are the ten:

Goodyear Tire and Rubber Co.	360
General Motors	498
General Electric Company	145
Hall Printing Company	70
National Carbon Company	72
Firestone Tire and Rubber Co.	142
Crane Company	343
American Can Company	277
National Biscuit Company	80
International Motor Company	122

If it is good business for these concerns to use Stuebing Lift Trucks, it's good business for you, isn't it?

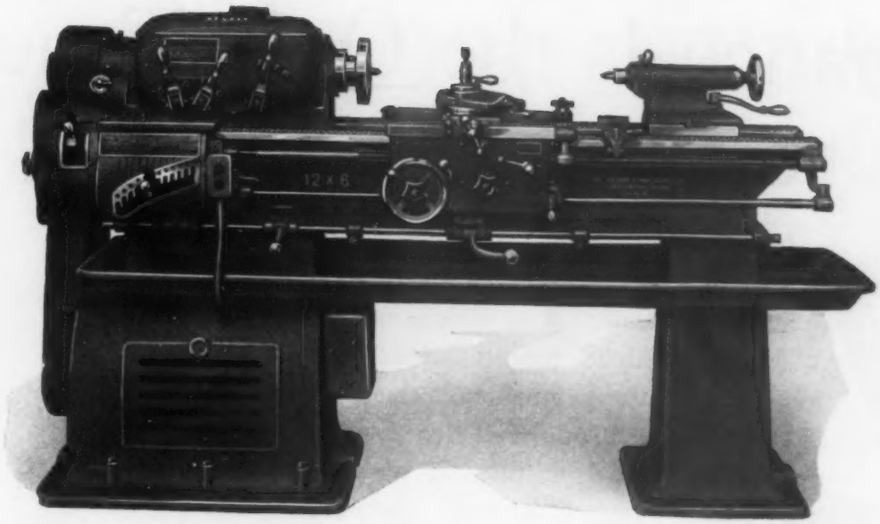
Write Dept. K13

THE YALE AND TOWNE MANUFACTURING COMPANY
STUEBING DIVISION • • CINCINNATI, OHIO



TRADE StueBing MARK

YALE Hoisting and Conveying Systems



The Hendey Line of "QUALITY MACHINE TOOLS" Includes:

Cone Head Engine Lathes from 12″ to 24″ swing.

Geared Head Engine Lathes from 12″ to 24″ swing.

Crank Shapers in sizes of 16″, 20″, 24″ and 32″.

Centering Machines in Single and Double Spindle types, 4″ capacity. . . . . .

And each of these machine tools is the finest that engineering skill, highest grade products, and sixty years of machine tool experience can produce. . . . . We would like the opportunity of telling you how Hendey Equipment is constantly establishing new standards of quality—not only in tool rooms, but on production lines as well. . . . . Your inquiry involves no obligation.

HENDEY QUALITY
"AN IDEAL IN 1870
"A REALITY IN 1930

The HENDEY Machine Company
TORRINGTON, CONN.

LATHES SHAPERS

Performance Is the Only True Measure of a Crane's Cost

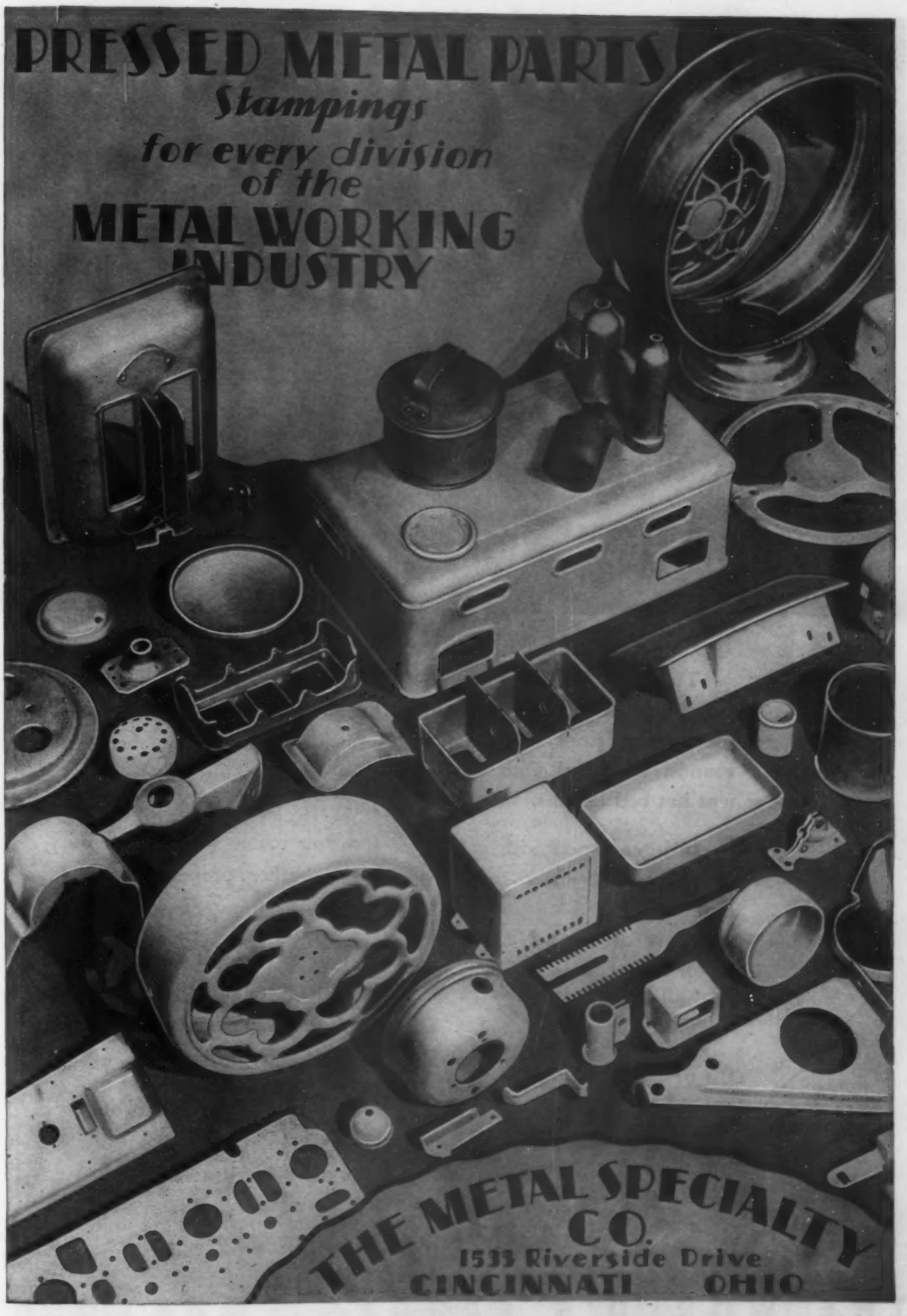
Lower priced cranes are always available, yet it is a fact that there are thousands more Industrial Brownhoists in service than any other make. ▲ ▲ This outstanding preference for a somewhat higher priced product can only be accounted for by the better performance these cranes deliver on the job. ▲ ▲ Every Industrial Brownhoist is suited for the work it is sent out to do because we build a size and type for every purpose. ▲ ▲ With many cranes still in service after twenty to thirty years of hard work, users know that a little higher first cost for an Industrial Brownhoist means a far greater saving in the end.

Industrial Brownhoist Corporation, General Offices, Cleveland, Ohio

District Offices: New York, Philadelphia, Pittsburgh, Detroit, Chicago, New Orleans, San Francisco, Cleveland.

Plants: Brownhoist Division, Cleveland; Industrial Division, Bay City, Michigan; Elyria Foundry Division, Elyria, Ohio.

INDUSTRIAL BROWNHOIST


PRESSED METAL PARTS
Stampings
for every division
of the
METAL WORKING
INDUSTRY
THE METAL SPECIALTY
CO.
1533 Riverside Drive
CINCINNATI OHIO

New ROTARY FLYING SHEAR *for* CUTTING STRIPS, FLATS ROUNDS, ETC *in* HOT BED LENGTHS

PATENT APPLIED FOR

This new "United" rotary flying shear was specially developed for cutting strips, skelp, small rounds, flats, etc., into convenient hot bed lengths.

It is equipped with a flying cutter coupled direct to a mill type motor and an anvil roller which is driven by a separate motor at the same speed as that of the material being cut.

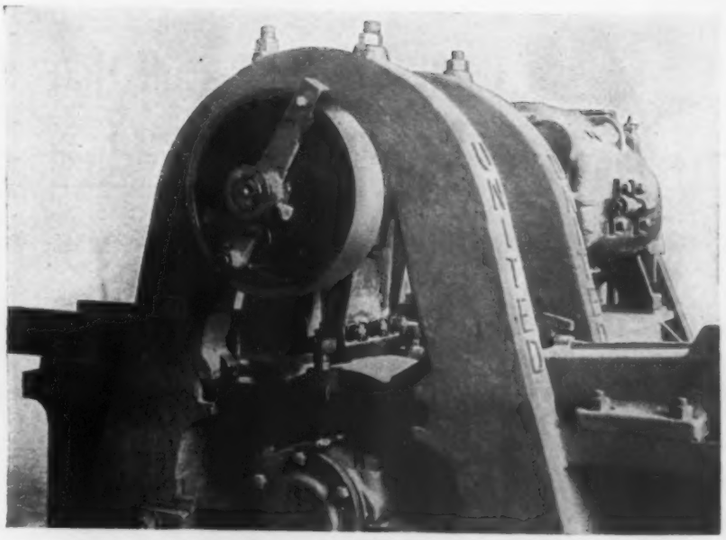
A control apparatus of original "United" design enables the operator to synchronize the speeds of the flying cutter and the anvil roller.

Another important feature is the novel operating cycle employed which permits the shear to operate at various speeds up to 3000 feet per minute by a start and stop motor without the use of any other propelling power such as steam or compressed air.

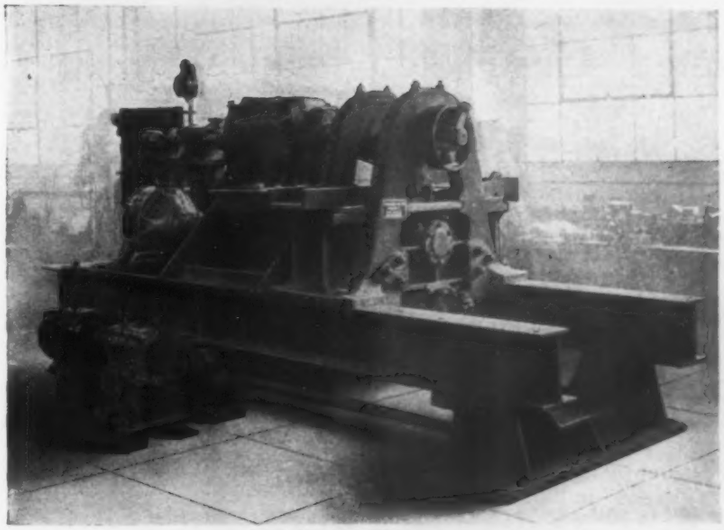
One of these shears in operation for several months has shown surprising results, as to reliability and simplicity of operation.

Three additional shears of this type are now in course of construction and being installed.

THE WORLD'S LARGEST MAKER OF



Close-up view of shear, showing flying cutter and anvil roller.



A "United" rotary flying shear with capacity for cutting
7"x¼" maximum } Hot
¾"x0.028" minimum } Strip

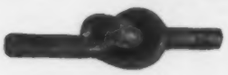
UNITED

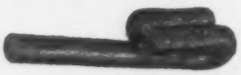
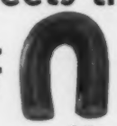
ENGINEERING & FOUNDRY COMPANY

PITTSBURGH, PENNSYLVANIA

ROLLS AND ROLLING MILL EQUIPMENT

Bend It Hot - - - Bend It Cold
Knot It Like A Rope

That's the way to find out the stuff that Reading Bar Iron is made of! It's Genuine Puddled Wrought Iron, of course, with  the tough, fibrous structure that gives it the ability to stand continued strain and vibration without fracturing or crystallizing!

All Reading Bar Iron is made  of the original, time-tested, Genuine Puddled Wrought Iron. In all grades, it meets the chemical and physical requirements of  severest uses. The name "Reading" is your protection from substitutes.

Reading Bar Iron is furnished in the following sizes:
Rounds 1/2" to 4 1/2" in diameter. Squares 1/2" to 4"
Flats 1" x 1/4" to 10" x 2". Half Rounds 7/8" to 1 1/2".
Hexagons 5/8" to 1 3/4" inclusive.

READING IRON COMPANY, Reading, Pennsylvania

Atlanta · Baltimore · Cleveland · New York · Philadelphia
Boston · Cincinnati · St. Louis · Chicago · New Orleans
Buffalo · Houston · Tulsa · Seattle · San Francisco
Detroit · Pittsburgh · Los Angeles · Kansas City

READING BAR IRON
GENUINE PUDDLED WROUGHT IRON

HORSE HEAD *UNIFORM QUALITY* ZINC

FOR THE DIE-CASTING INDUSTRY

Chromium plated radiator cap,—die cast from an alloy of Horse Head Zinc.

ASTRIDE the radiator, a beautiful die casting, symbol of the grace of modern motors. Under the hood a die casting, the carburator . . . sturdy . . . pulsing, life giver of motive power. On the dashboard more die castings—control levers,—commanding the every moment of performance. Throughout the body, die cast hardware . . . fitting companion for interiors created by the nation's foremost designers.

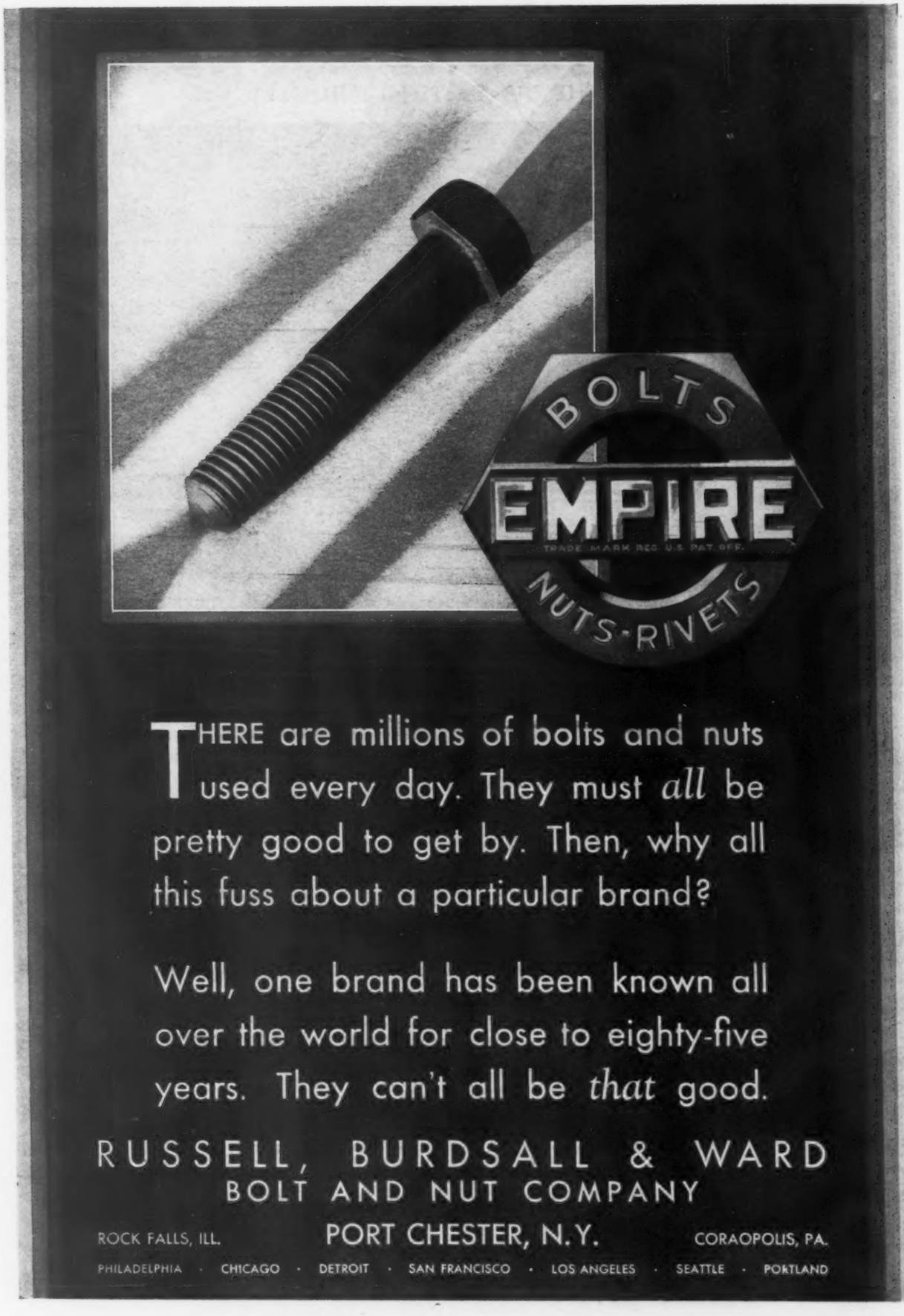
Die castings serve hundreds of masters, in hundreds of ways.

Such a variety of uses, because of absolute certainty of quality—and more—*uniformity*. Horse Head—*uniform quality*—Zinc is the zinc base of die casting alloys not only throughout the automobile, but throughout industry. Its uniformity assures dependability.

THE NEW JERSEY ZINC COMPANY

160 FRONT STREET, NEW YORK CITY

Zinc Metal and Alloys ▪ *Rolled Zinc* ▪ *Zinc Pigments* ▪ *Sulphuric Acid* ▪ *Spiegeleisen*



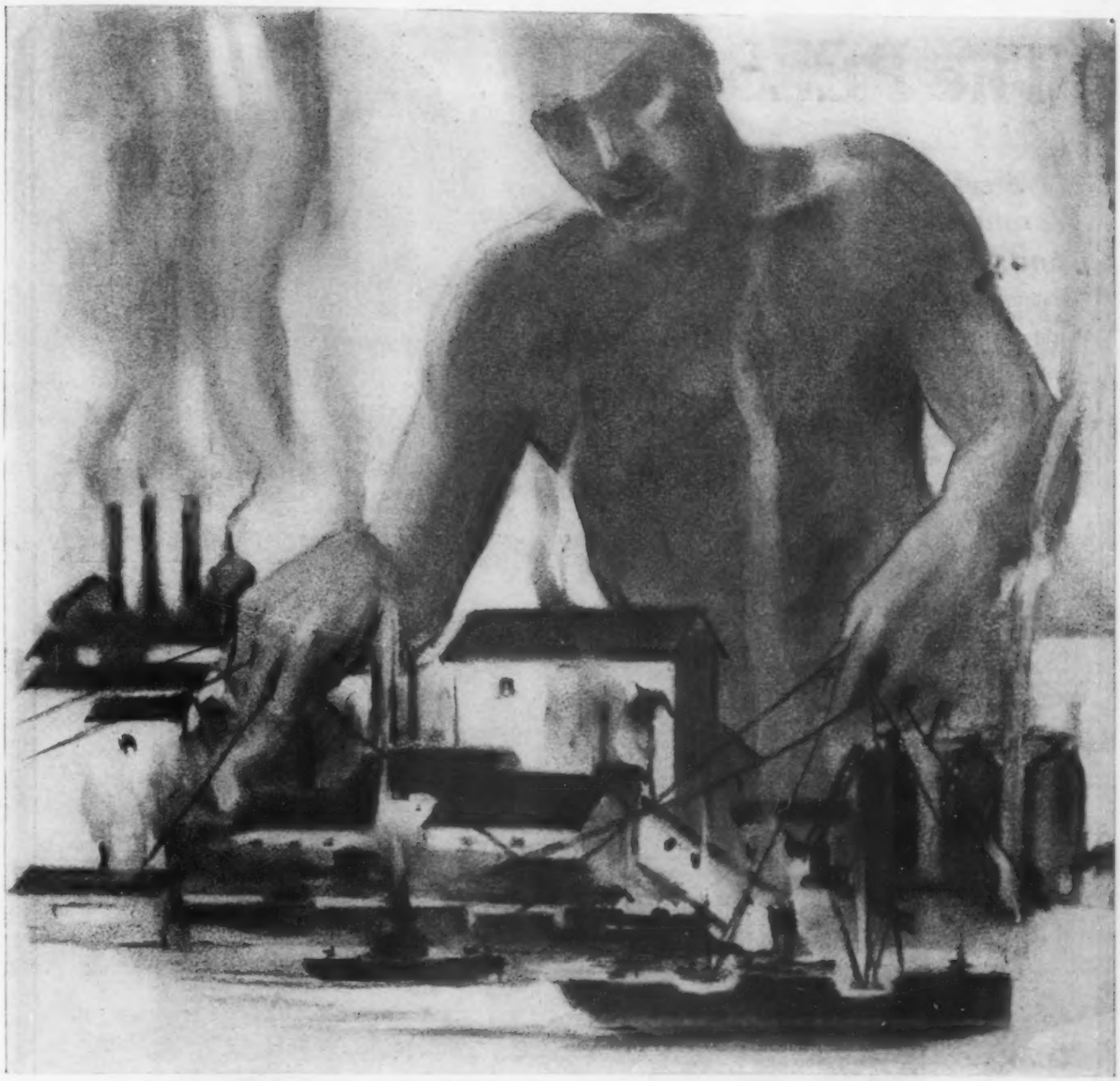
THERE are millions of bolts and nuts used every day. They must *all* be pretty good to get by. Then, why all this fuss about a particular brand?

Well, one brand has been known all over the world for close to eighty-five years. They can't all be *that* good.

RUSSELL, BURDSALL & WARD
BOLT AND NUT COMPANY

ROCK FALLS, ILL. PORT CHESTER, N.Y. CORAOPOLIS, PA.

PHILADELPHIA · CHICAGO · DETROIT · SAN FRANCISCO · LOS ANGELES · SEATTLE · PORTLAND



Resources ^^^

which insure the utmost quality and purity are the secret af the efficiency of the

Wyandotte
METAL CLEANERS

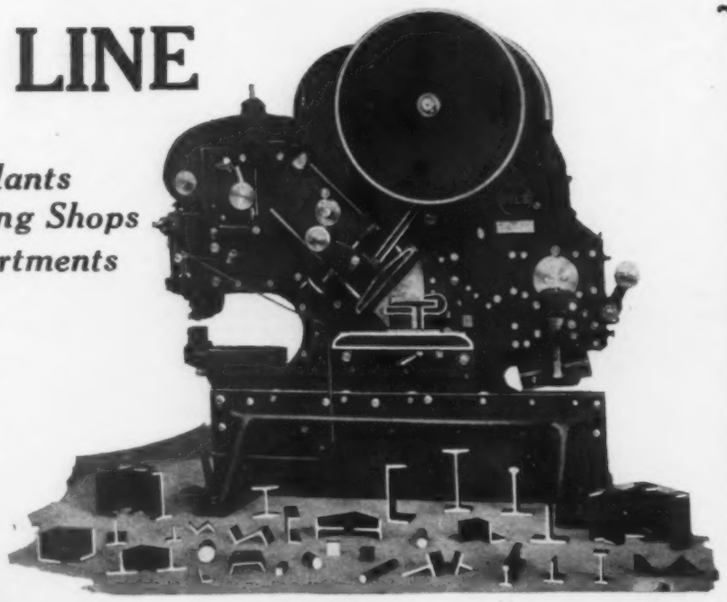
THE J. B. FORD CO. Sole Mfrs. WYANDOTTE, MICHIGAN

The PELS LINE

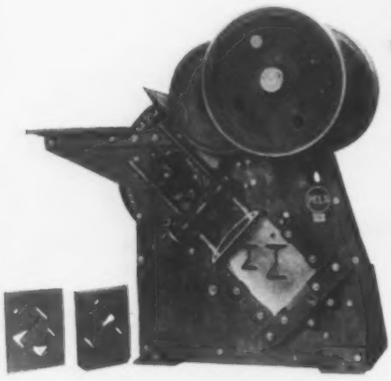
for use in
Steel Fabricating Plants
Warehouses, Iron Working Shops
and Maintenance Departments

We have types and sizes for every purpose, whether it is just to cut off stock, light or heavy, or whether the machine is to be used on all around cutting, punching, splitting, coping, etc.

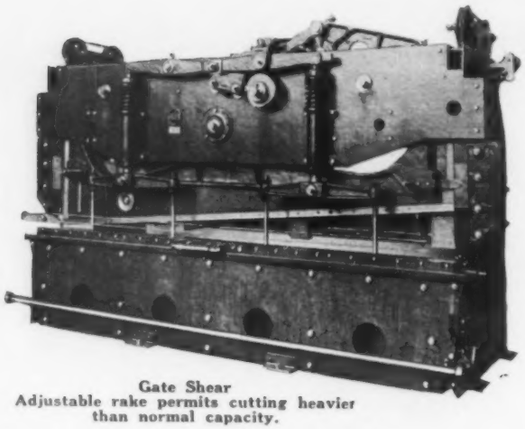
The Pels Steel Plate Frame is guaranteed unbreakable; incidentally, it is particularly well adapted where shears must be portable.



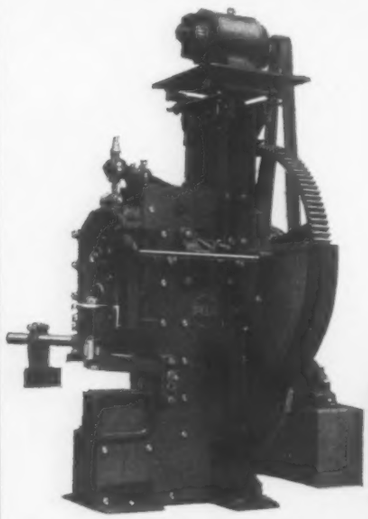
PELS COMBINATION SHEARS and PUNCHES
—available with Coper, also—are the most universal piece of equipment in the steel shop.
10 Sizes—shipment generally from stock.



Angle and Bar Shear single end style. Cuts angles square and on bevel, rounds, squares, flats, tees, without change of knives.



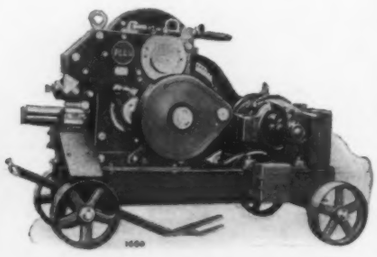
Gate Shear
Adjustable rake permits cutting heavier than normal capacity.



Open Throat Shear will cut bars in bundles.

Henry Pels & Co. INCORPORATED
90 West St. New York

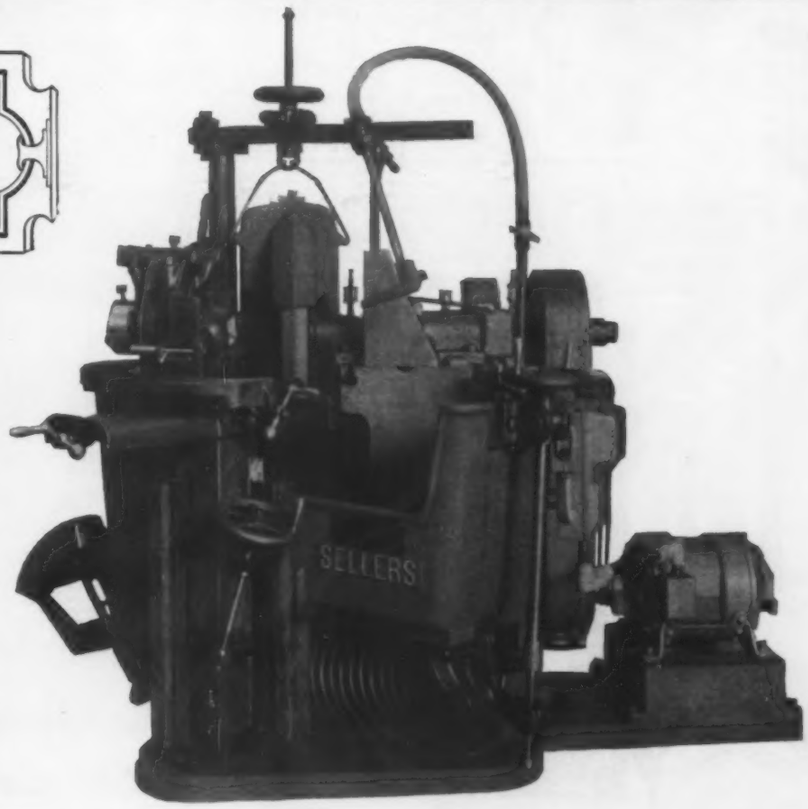
Also: Billet Shears, Beam Shears, Scrap Shears, Copers, Benders



Portable Bar Cutter

SHEARS-PUNCHES-HEAVY PRESSES

SELLERS
TOOL GRINDER



For Uniform Tool Grinding

The Sellers Tool Grinder produces any desired shape of tool from rough forgings and is equally efficient in retouching the daily run of dull tools. It saves both tool steel and cutting time by grinding away only enough metal to exactly duplicate the correct cutting edge.

Operating handles are conveniently grouped for rapid adjustment and easy operation. The scale graduations, indicating angles of rake, clearance, etc., are large and easily readable.

Sellers Tool Grinders are built in two sizes—for tools up to 3″ x 3″ section and for tools up to 2″ x 1½″ section.

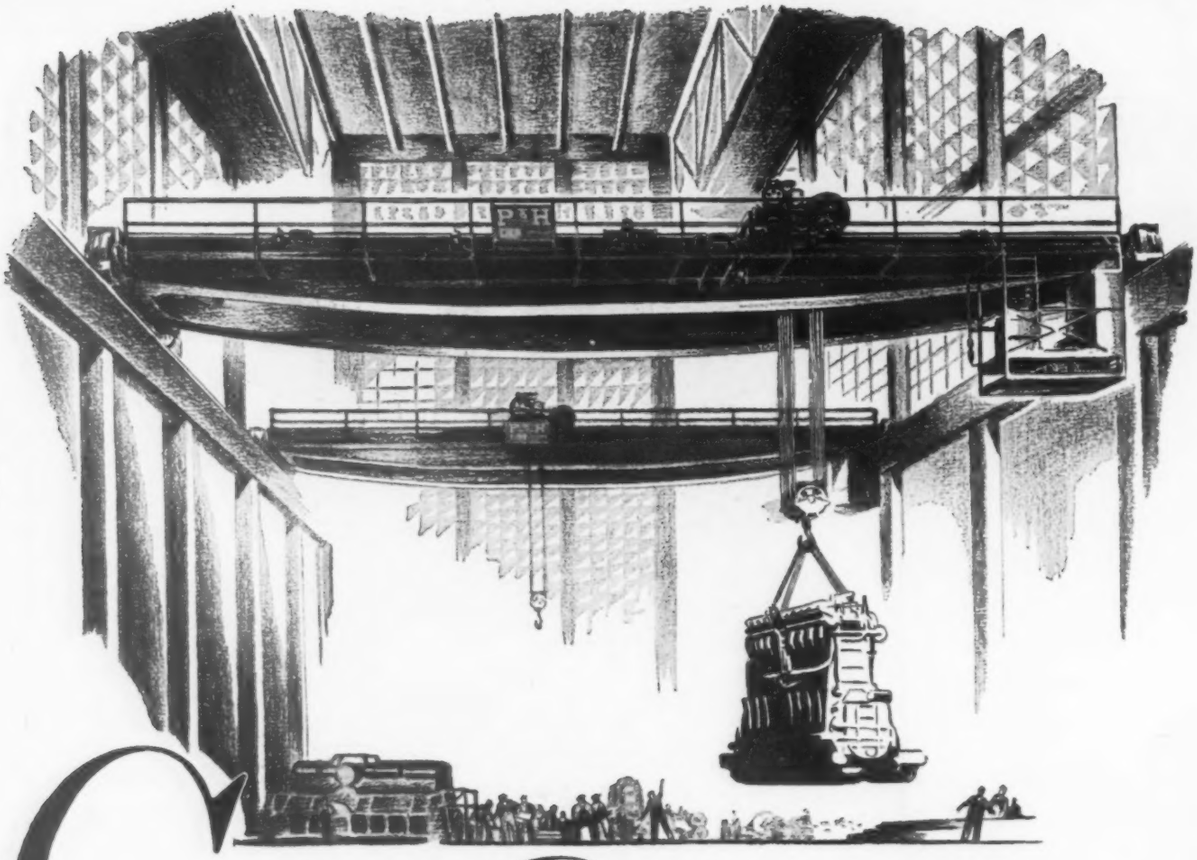
Let us send complete descriptions of their many distinctive features.

We also manufacture:

Planer-type Milling Machines; Floor Boring Machines; Large Boring and Turning Mills; Planers; Drill Grinders; Railway Shop Tools; Sand Aerators for foundries.

WM. SELLERS & CO., Incorporated

1600 Hamilton Street Philadelphia, U. S. A.



CRANE RELIABILITY.. *that protects* PROFITS

YOUR profit, based upon close figuring, requires that machines, men and equipment keep going.

You cannot afford delays that you haven't figured on. Think what a serious crane tie-up would cost you. Think what it would mean in losses all down the line. Make sure that you have crane reliability that protects profits.

Throughout industry, P & H Overhead Traveling Cranes are meeting plant haulage demands. Their reliability, proved in more than 9,000 installations, insures against service interruptions. Their speed, safety, and easy accuracy of control . . . results of 40 years of leadership in crane development, mean low-cost haulage.

In P & H Cranes, you get undivided responsibility. They are built completely in the P & H plant from superior materials and by an organization that has built more cranes than any other builder in the world.

Among the thousands of P & H Crane users, the following are typical:

	Number of Cranes
Anaconda Copper Co.	285
Allis Chalmers Mfg. Co.	274
Bethlehem Steel Co.	246
American Smelting & Refining Co.	107
International Harvester Co.	84
Weyerhaeuser Timber Co.	82
Ford Motor Co.	77
Pennsylvania R. R.	45

If you have an overhead haulage problem, write us. We will gladly cooperate with you . . . place our vast crane-building experience at your disposal without obligation.

HARNISCHFEGER CORPORATION
Crane and Hoist Division
3801 National Avenue, Milwaukee, Wis.

P & H *Traveling* CRANES

(a-517)

For Strength and Uniformity Use

WICKWIRE SPENCER MAKE UNIFORM

Wire of all kinds
Wire Rope
Wire Reinforcing Fabric
Clinton Wire Lath
Wire Screen Cloth
Wire Poultry Netting
Chain Link Wire Fence
Wire Springs and Spirals
Wire Kitchen Utensils
Wire Bathroom Fixtures
Wire Grilles and Cages
Wire Diamond Mesh
Perforated Metal Grilles
Perforated Metal Screens
Perforated Centrifugal Linings
Wissco Card Clothing
Wissco All-Steel
Radiator Furniture

IN UNIFORMITY alone there is dependability. And in no product is dependability more important . . . and necessary . . . than in Wire Rope.

The ability of Wickwire Spencer to manufacture uniform wire . . . uniform metallurgically as well as physically . . . is the keynote of its unquestioned success as producers of uniform Wire Rope.

There are as many kinds of Wire Rope as there are uses. Consistent acquaintance with the needs of all industry has made it possible for Wickwire Spencer to develop a special rope best suited for the service it will be called upon to perform. The Common denominator, however, of all ropes that this Company makes . . . as well as its other wire products . . . is uniformity.

WICKWIRE SPENCER STEEL CO.
43-49 East 42nd Street New York City

Worcester	Chicago	Los Angeles
Buffalo	Atlanta	Seattle
Cleveland	San Francisco	Portland

WICKWIRE SPENCER
WIRE PRODUCTS

CRAFTSMANSHIP CONTROLS QUALITY

THE flower of the ingenious craftsmanship of Henry Englehard Steinway is a piano without a peer for purity of tone, richness of volume and artistic workmanship. With his decided musical talent seeking for expression, Steinway was unable to find his dreams of the ideal piano realized in any instrument made in his time.

Being a skilled craftsman he decided to try making a piano that would satisfy his exacting requirements. The result is an epoch in musical history.

The history of steel making owes much to the intelligent and persistent efforts of those skilled workers who have developed their craftsmanship by practical experience in the various operations. It is of such men that the controlling executives of this organization are composed. They know steel from first-hand experience in making it for many years. Their skill and knowledge is definitely reflected in the superior quality of Empire products.

This superior quality is rigidly held to a standard by exhaustive tests and painstaking inspection at each step of production. This control of quality insures the smoothness of finish, ease of fabrication and dependability of service in the finished product sought by the discriminating manufacturer. May we confer with you on your requirements?

Empire Steel Corporation, Mansfield, O.

Sales Offices: New York - Philadelphia - Cleveland - Indianapolis
Chicago, Ill. (McGraw-Hill Bldg.) - Detroit - St. Louis

Empire Products

BLACK SHEETS

AUTOMOBILE SHEETS

METAL FURNITURE SHEETS

CEILING STOCK

REGULAR AND SPECIAL LOCKER STOCK

REGULAR AND SPECIAL JAPANNING STOCK

SINGLE PICKLED SHEETS

BOW SOCKET SHEETS

MILK CAN STOCK

ENAMELING STOCK

AUTO LICENSE PLATE STOCK

NICKELPLATING STOCK

FULL PICKLED SHEETS

ELECTRICAL SHEETS

COPPER BEARING SHEETS IN ALL FINISHES

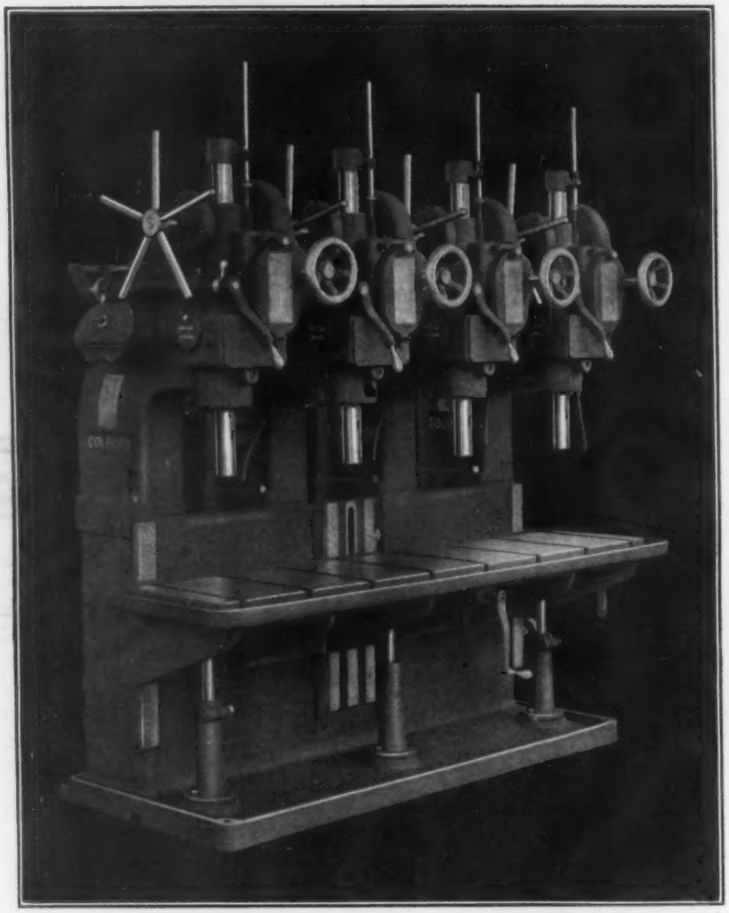
"WABIK" METAL—(SPECIAL VITREOUS ENAMELING STOCK)

EMPIRE STEEL SHEETS

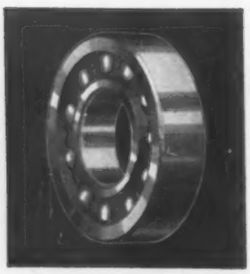
H·B VSCH
EMPIRE
STEEL SHEETS

NEW DEPARTURE BALL BEARINGS

One peek reveals the reason



One peek into the gearbox of a Colburn drill press reveals the reason for its tremendous power and its absolute smoothness at all speeds. The heavy gears are carefully cut—the short rigid shafts are accurately mounted in husky New Departure Ball Bearings. No matter how tough the material being drilled or whatever the speed chosen for doing it, the Colburn gear train is always held in true alignment by its New Departures — year after year with no sign of wear, with little maintenance attention and with far greater economy of power than would be possible with any other type of bearing. Carry your loads and meet your speeds with New Departures . . . The New Departure Mfg. Co., Bristol, Conn.



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Contents for APRIL 3, 1930

Tunnel Lining of Welded Steel 985
Detroit-Windsor Vehicular Tube Not to Use Cast Iron Segments

Automotive Buying of Machine Tools 990
Group Is Largest Single Purchaser, With a Few Lines Predominating

Makes Rustless Steel Castings 993
Special Heat and Acid-Resisting Products Includes Centrifugal Pipe

Production Control in Machinery Plant 997
Applied to Building of Large Machines, It Helps Keep Delivery Promises

New Method of Bright Annealing 1002
Atmosphere Is Controlled and Charge Is Suspended from Cover of Thin Pot

Large and Unusual Drop Forgings 1005
Massive Pieces Made in Single Pair of Dies at Locomotive Works

Steel Wages Under 8-Hour Day 1008
Metal-Working Trades Continue to Be High-Wage Industries

Drop in Exports Mainly in Scrap 1010
Heavy Decline from Last Year in Rolled and Finished Products

Moderate Demand for Steel 1015
Dr. Haney Looks for Only Average Conditions, as February Produced Over-Supply

Machinery Exports Continue Large 1052
Decline from January Leaves February the Sixth Heaviest Month

New Equipment 1012

This Week's IRON AGE in Brief 1016

Personal Notes 1025

EDITORIALS 1026

The Week in Business 1029

Iron and Steel Markets 1030

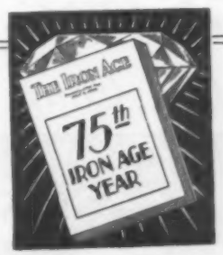
Non-ferrous Metal Markets 1045

Foreign Steel Markets 1049

Machinery Markets 1052

New Trade Publications 1057

The Week's News Quickly Told 1058



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THE IRON AGE

New York, April 3, 1930

ESTABLISHED 1855 VOL. 125, No. 14

Tunnel Lining of Welded Steel

Detroit-Windsor Vehicular Tunnel, Largest Shield-Driven Tunnel, Lined with Structural Steel Instead of Conventional Segments of Heavy Cast Iron

BY S. A. THORESEN*

TUNNELING through soft material is always done by means of a shield, propelled by hydraulic jacks and followed up by a lining built of a series of rings, each ring made up of a number of segments. (The method is explained by the sketch on page 989.) Each segment of the lining has a web or skin conforming to the tunnel circumference and provided with stiffening and splicing flanges along its four edges. When erected, the skin forms its own part of a continuous enveloping cylinder, which is stiffened by the circumferential flanges. Segments and rings are connected by means of bolts through these flanges.

It is at once apparent that the lining for shield-driven tunnels must be able to withstand the external forces, namely the weight of the lining and the surrounding earth pressure, and at the same time resist the thrust of the jacks which force the shield ahead against the slowly resisting clay or sand. Furthermore, it is required that the lining must be water tight.

This method of tunneling has been highly developed during the past 30 years and utilized for many railroad and subway tunnels, notably those carrying the Pennsylvania Railroad lines into the city of New York. A more recent and even larger application was for the Holland tunnels, the remarkable vehicular tubes under the Hudson River. All these tunnels were lined with cast iron.

The use of cast iron built in successive rings, each comprised of several segments, as a material for tunnel construction dates back only to 1869, when it was employed by J. H. Greathead in the Tower subway, London, although Marc Brunel proposed its use in 1818. In fact, cast iron for lining shafts was actually used for the first time in England in 1795. Since the year 1869, the material principally used for primary lining in large shield-driven tunnels has been cast iron, although in a few cases wood or masonry (the materials used by earlier engineers) have been substituted. Steel has been used very rarely.

*Engineer of designs, Parsons, Klapp, Brinckerhoff & Douglas, New York.

Relative Advantages of Cast Iron and Steel

Preliminary studies for the lining of the shield-driven portion of the tunnel now being built between Detroit and Windsor, Canada, showed that it would be desirable to use materials such as wood or cast iron for the immediate support of the ground, this to be later covered or reinforced with concrete as a secondary lining, useful both for a surplus of strength and for finish. As the enterprise is financed by private capital, it was necessary to design the most economical lining that also possessed the advantages of lightness, ease of erection and adequate strength.

Cast iron fulfilled two of these requirements, namely ease of erection and adequate strength but was eliminated on account of its cost. Wood fulfilled three of the requirements but was rejected due to insufficient strength for a tunnel of this magnitude (the diameter of the shield, 32 ft., is one of the largest on record). It became, therefore, of utmost importance to introduce structural steel as a lining, because it best fulfilled all the demands and met the conditions peculiar to the characteristics of the Detroit clay, through which the tunnel was to pass.

In designing a tunnel lining both the construction stresses and the permanent stresses must be taken into consideration. An exact mathematical analysis cannot be made, because the exact amount of earth pressure or the force to be exerted by the jacks cannot be computed in advance. However, by assigning limiting values lying between the conditions of fluid quicksand, on the one hand, and dry, firm material on the other, it is possible to calculate the stresses with sufficient accuracy. The steel in the primary lining was therefore designed to carry a compressive stress of 14,000 lb. per sq. in., under the worst anticipated loads, leaving the surplus of strength possessed by the steel available for any possible distortion in the lining which might be produced when driving through soft, water-bearing material or through local sandpockets

filled with water or by extra severe erection stresses.

Design of the Steel Lining

At first we contemplated the use of riveted structural steel. To a ½-in. skin plate was to be riveted a circumferential channel or angle provided with angle stiffeners to resist the thrust of the shield jacks. When later studies indicated that the maximum capacity of each jack should be increased to 150 tons, it became evident that these relatively lightly braced segments would have to be abandoned for a more rational type in the form of pressed steel fabricated by electric arc welding. In cooperation with the Commercial Shearing & Stamping Co., Youngstown, a most successful welded lining was designed and produced, details of which are shown in the accompanying illustration, Fig. 2. Fabrication routine will be described later.

Each circular ring is composed of eleven of the segments illustrated. The width of each ring measured parallel to the tunnel axis is 2 ft. 6 in., and the diameter of the ring is 31 ft. 8 in., so that it fits easily inside the protecting skirt of the shield. Therefore, when one complete set of eleven rings is erected, 2½ ft. of the tunnel length is lined.

Each segment consists of a ⅜-in. plate *A*, about 4 ft. wide and 9 ft. long. Each edge is bent up into the shape of a channel with 9-in. flanges. In the long direction this channel is curved to conform to the circumference of the tunnel. Continuous angles *B* are welded to the inside of the flanges, which further increases the rigidity of the segment and its strength as a whole. To the ends of the segment are welded ⅜-in. plates *C*, punched for bolting to its neighbors.

Short I-beam stiffeners *D* are then welded between the flanges; their function is to take the thrust of the shield

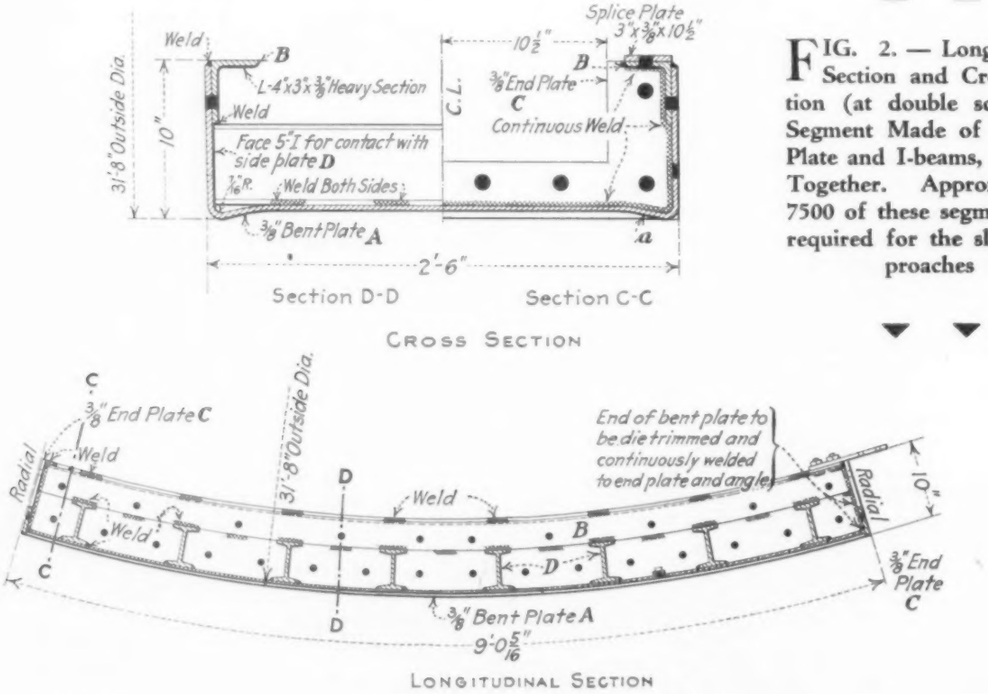


FIG. 2. — Longitudinal Section and Cross Section (at double scale) of Segment Made of Pressed Plate and I-beams, Welded Together. Approximately 7500 of these segments are required for the shore approaches

jacks. These 5-in. I-beams are spaced 13½-in. centers, so that three beams resist the thrust of one jack, and limit the compressive stress to 23,000 lb. per sq. in., when the maximum force of 300,000 lb. is exerted by each jack during the shove.

Fabrication by Pressing and Welding

Steel for the lining is mild open-hearth steel of pressing quality. Skin plates were formed cold from a blank approximately 4 ft. x 9 ft. x ⅜ in., sheared accurately. This blank was doped with lubricating compound, turned over, and fed into the forming die. Pressing was done in a 1500-ton mechanical press, specially equipped with a hydro-pneumatic brake acting against the face of the punch to put a reverse bend in the outer portion of the skin plate at *a*, Fig. 2, so that the outer portion of the skin plate was brought in toward the inner flanges to meet the I-beams square across their entire cross section.

This die formed the flanges on the edges and bent the plates lengthwise to the proper radius in one operation. Roller conveyors then fed it into a trimming die in an adjacent press. Extreme accuracy was required to trim the formed plate to correct dimension, both as to length and angularity, in order that the diameter and circumference should be maintained, and the bolt holes match those in adjacent rings. Consequently the trimming die trimmed the leading end of the entering plate and the following end of the outgoing plate simultaneously. After this operation each plate was checked against a template, marked and placed into stock.

End plates *C* were blanked from plate material, which accurately determined the length and width. Holes were punched by two sets of gang dies, one punching the four horizontal holes and the other the two vertical holes in each side. Each plate was flattened by hand after blanking and punching in order to insure a perfect fit.

Angle stiffeners were bent to the proper radius in a clapper die, two angles at a time, back to back, thus insuring that the curvature was maintained clear to the end of the angles. Each angle was inspected for curvature as it left the press. After inspection they were carefully handled to a cut-off die, which trimmed them to the exact length. From here they went to a piercing die, which punched two holes for the splice straps at each end.

The I-beam stiffeners *D* are 5-in. sections weighing 14.75 lb. per ft. Inasmuch as the specifications called for a perfect bearing against the flanges of the skin plate, unusual care had to be exercised to cut the beams with all surfaces square and of correct length. A number of the beams were cut off in a shaping saw and others by means of a die.

All these component parts of one segment were assembled with clamps and tacked welded. Complete welding then proceeded, about 32 ft. of bead being required to make 1000 lb. of steel into one unit. After welding, each segment went to a pneumatic punch, which pierced the 26 ⅞-in. holes through each upturned edge, using a template bushed with hard steel clamped on each side. The plates were then tapped for the grout pipe and ground, inspected and stocked in the yard ready for delivery to the job.

All details of the manufacture of these segments were carefully watched and constantly checked to insure the proper fit in the tunnel. As an illustration of the accuracy of the work performed, where two rings were bolted together for checking purposes, the actual circumference measured with a steel tape came within 3/32 in. of the theoretical circumference.

Steel Lining Proves Flexible When Erected

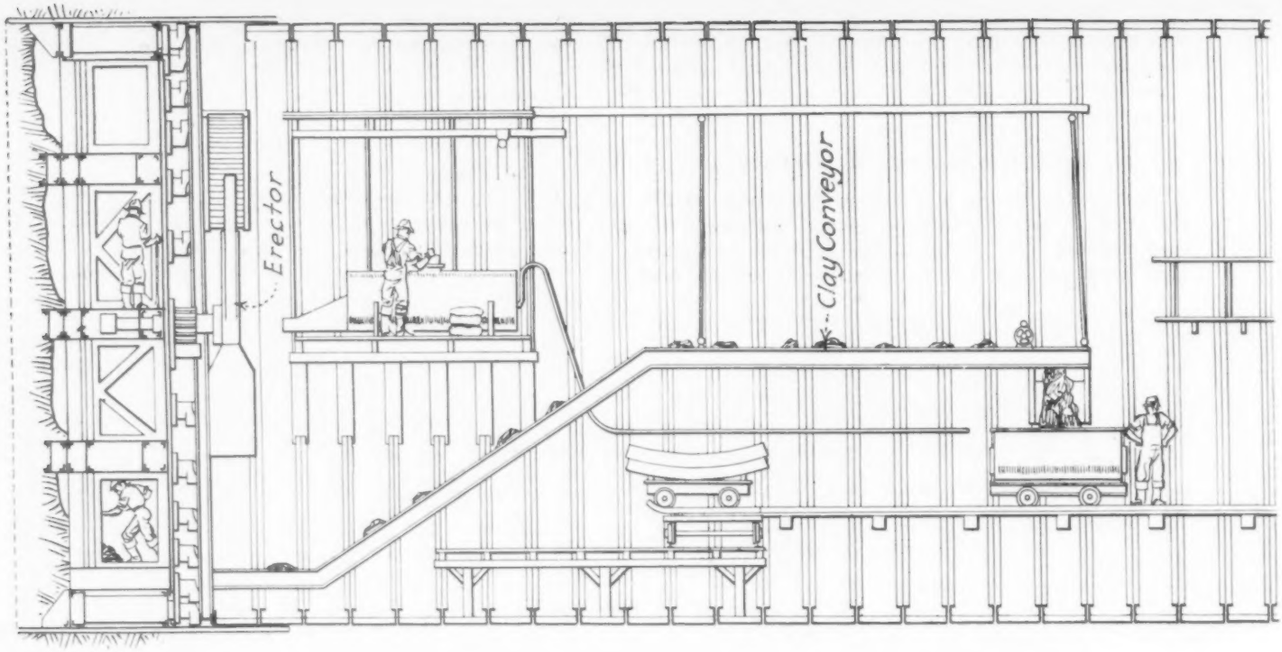
By measurement it was determined that the earth pressures distorted the rings in places a maximum of 3 or 4 in., the vertical diameter being shortened to this extent. This was found to be partly due to the plastic nature of the clay which worked down into the annular space left around the lining when the skirt of the shield

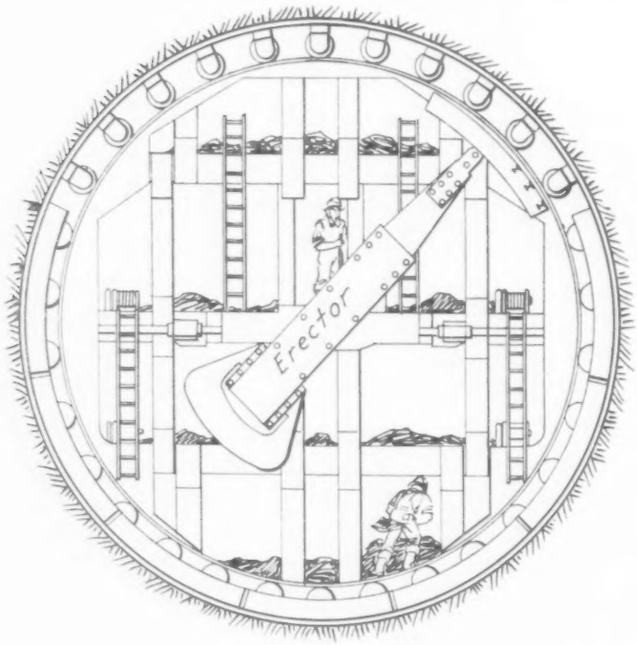
ALTHOUGH one of the world's longest suspension bridges has recently been thrown across the Detroit river, a vehicular tunnel a mile and a quarter long, connecting the cities of Detroit, Mich., and Windsor, Ont., will be opened within a few months. Since the latter connects the business centers it is expected to serve commercial and commutation traffic, whereas the bridge, being four miles upstream, will doubtless be more popular to long-distance travelers who desire to avoid congested centers.

This tunnel is one of the world's largest in diameter, and has the further distinction that the approaches driven by the shield method through compact clay, are lined with segments fabricated from structural steel by welding, rather than the cast iron ordinarily used for this purpose.

The accompanying article explains advantages of this method and the shop methods for fabricating the lining segments to close dimensional tolerances.

While the matter is not mentioned in Mr. Thoresen's article, welding was also extensively used in manufacturing the lining for the portion of the tunnel under the navigable channel of the river. Huge cylinders of steel, 31 ft. in diameter and about 250 ft. long, were constructed of steel plate, lined inside and outside with concrete, bulkheaded at the ends, launched, towed to the site, sunk into a trench dredged in the river bottom, and pinned to neighboring sections by divers. All longitudinal seams in this sub-aqueous lining were butt-welded joints; all circumferential seams were riveted, but arc welded on the outside lap for water-tightness.





advanced. The arching value of the ground across the excavation is not sufficient to sustain the vertical load, and when it was transferred to the tunnel lining caused the deformation. This distortion occasioned some inconvenience from the start in bolting up the circular joints of the segments, but on account of the elastic properties of the lining the situation was remedied by the use of proper air pressure and the distortion was limited to 1 in. or less. A most satisfactory check against the mathematical calculation of the lining is the demonstrated fact, that it has been subjected to critical external pressures without showing any sign of deficiency in strength or excessive distortion.

The joints, radial and circumferential, are waterproofed with asphalt mastic applied to the flanges prior to erection and by this simple method leakage has been reduced to a minimum. Caulking of the steel has been entirely eliminated.

Little difficulty has been experienced in holding the lining to true grade and alinement. The use of taper rings has made it possible to compensate for horizontal or vertical deviation and to follow closely any curves in the alinement.

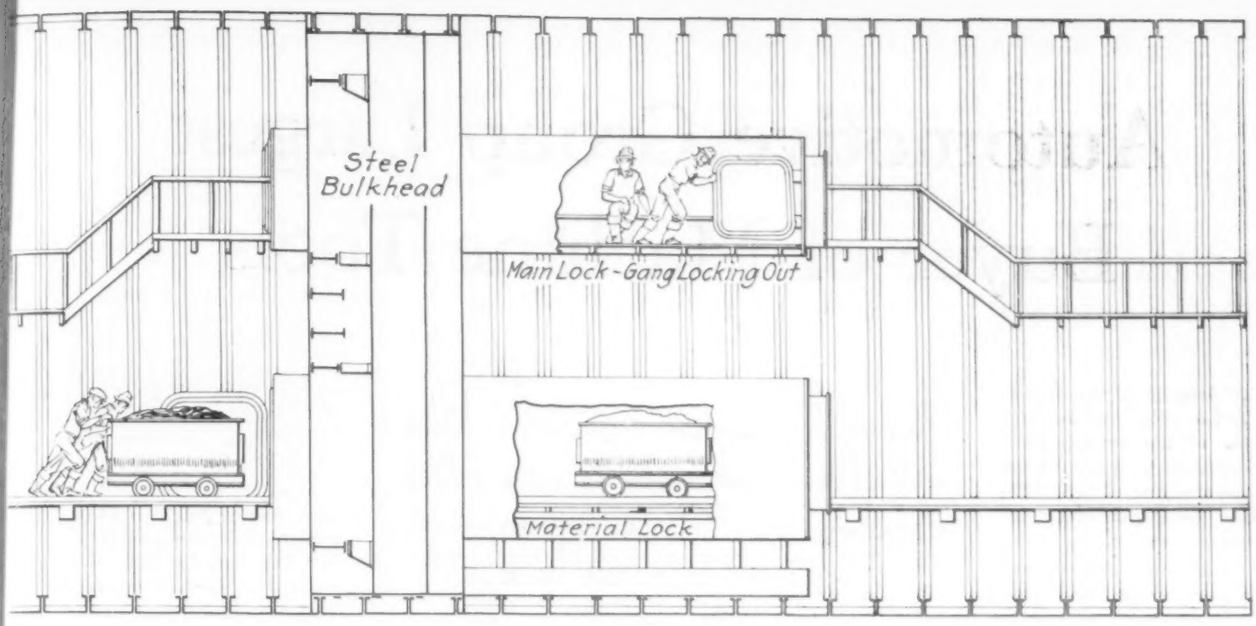
Maximum progress as recorded in 24 hr. is six rings or 15 ft. This is limited principally by the difficulty of removing the firm clay encountered.

Comparison of Weight and Cost

A comparison between the cast iron and the pressed and welded steel lining designed for such conditions as are met in tunneling Detroit clay may be summarized thus:

Based on large tunnels having diameters ranging from 18 ft. to 35 ft., calculations indicate that cast iron will weigh about 3 times as much as pressed steel, the exact ratio depending somewhat on the engineer's assumptions of the loads to be met. The cost per ton of cast iron is about one-half the cost of steel. The cost of transportation and handling the material in the tunnel is a decided item in favor of steel, while lightness and flexibility contribute further to a saving in cost. In the final total the cost of pressed steel lining is about two-thirds that of cast iron.

In this analysis it should be remembered that a cast iron lining which is thick enough to resist the imposed loads is also thick enough and of such a nature as to resist corrosion for centuries. While the rate of corrosion in water-tight clay, such as encountered in Detroit, will be very slow even on steel, and the grouting pumped through the openings in the lining to seal any cavities remaining behind the advancing shield will effectually protect large areas of the skin plate, the lining which was installed cannot be depended upon alone to function safely throughout the expected life of the tunnel. Consequently, a 20-in. lining of reinforced concrete is placed inside the shell, which by itself has ample strength to resist outside pressure, even after the ⅜-in. skin plate is entirely corroded away. The flanges and I-beam stiffeners, being



completely embedded in cement, can be counted on to endure.

Even with this inner lining of concrete, the completed job (steel lining plus concrete ring plus interior finish) is more economical than a cast iron lining plus the interior finish.

Conclusions and Acknowledgments

1. The introduction of pressed steel lining for use in tunnels of large diameters opens up a new market for the fabricated steel industry, and its success has been proved by actual demonstration in the Detroit-Windsor project.

2. Electric welding has been a contributing factor in the practical assembly of its individual parts.

3. Ingenuity in the development of powerful mechanical presses has made steel lining a reliable product, both with regard to rigidity and accuracy.

4. The most prospective field for the use of steel tunnel linings is in clay of consistency similar to material found throughout the Middle West, in cities such as Cleveland, Detroit, Chicago and Milwaukee. There is no doubt, however, that steel linings also will be utilized for tunnels driven in water-bearing ground under estuaries on the Atlantic seaboard or elsewhere.

5. Steel lining in combination with concrete will become a deciding factor in the economical development of future tunnels.

Many persons have cooperated toward the tunnel construction described. Parsons, Klapp, Brinckerhoff & Douglas, New York, are the engineers for the design and are supervising the construction of the whole project. W. S. Kinnear, also of New York, is the engineer representative of the owners, Detroit & Canada Tunnel Co. General contractors for the shield-driven and sub-aqueous portions of the tube are Porter Brothers & Robert Porter, of Spokane, Wash. As before mentioned, R. V. Proctor, chief engineer, Commercial Shearing & Stamping Co., Youngstown, gave valuable help in developing the constructural details of the steel lining.

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DIAGRAM and End View Showing Tunneling Operations and Installation of Welded Steel Lining.

The shield at the working face completely closes the end of the tunnel, and is strongly framed in structural steel. Numerous doors in it can be opened at will, and working through them laborers remove the soft ground in the line of the tunnel, the clay being carried back by a conveyor and loaded into small dump cars. The working chamber is under sufficient air pressure to hold back a rush of water or earth while digging is in progress. Consequently a bulkhead closes the tunnel near the shore end, and all men and material must pass in and out through the air locks.

As earth is removed ahead of the shield, the latter is forced forward into the void by a row of powerful jacks around the circumference; the outer edge of the shield is built as a stout blunt cutting edge and trims the exterior to shape. Extending backward from the cutting edge is about 15 ft. of thick steel plate, a continuous cylinder which supports the freshly tunneled ground between the end of the lining and the cutting edge.

When the shield has been jacked forward in this manner something over 2.5 ft., a lining ring can be erected. To do this, jacks are removed three at a time, a segment placed by the erector (which is a counterweighted arm geared to circular and radial motions), bolted securely to its neighbors, and the jacks shortened and replaced. This routine is repeated eleven times to make the full ring, equivalent to 2.5 ft. of lining. Cement grout is pumped through holes in the lining to fill any cavities and the annular space behind the advancing skirt of the shield, so that the earth load shall be properly spread over the entire lining. An interior ring of cement to finish the tunnel can be placed at leisure after excavation has been completed.

▼ ▼ ▼

In an investigation on the effect of hot and cold shaping operations on various steels, Sauerwald and others, in *Stahl und Eisen*, Nov. 19, 1929, page 1799, report results on a 25-per cent nickel steel and a 4-per cent silicon transformer iron.

It was found that with rapid working, or shaping, of the nickel steel at 900 to 1000 deg. C., the tensile properties were retained, while those of the silicon alloy tended to diminish. Both showed spontaneous crystallization at these temperatures, and both exhibited the maximum tensile strength in the "blue-brittle" range.

Automotive Group Largest Buyer of Machine Tools

Survey by The Iron Age Shows That All of 40 Companies Reporting Did Business with Motor Industry—A Few Lines Contribute Bulk of Business

▲ ▲ ▲

FORTY of the leading machine tool builders of the country have furnished to THE IRON AGE analyses of their 1929 sales by industrial groupings.

The automobile industry, including makers of parts and accessories, was by far the largest buyer of machine tools. All of the tool builders which reported derived a goodly proportion of their year's business from this particular group.

Other leading sources of machine tool buying were electrical equipment manufacturers, makers of machinery and equipment for the agricultural industry, steel companies, fabricated structural steel shops, material handling equipment builders, machine tool builders, miscellaneous machine shops and general machinery builders. Export trade was an important item with a majority of the machine tool manufacturers.

It is significant that many machine tool builders did the bulk of their business with a few industries. For example, one company which sold 60 per cent of its output to automobile and automobile parts and accessories makers, did 10 per cent with the aviation industry, 10 per cent with the agricultural equipment industry, 4 per cent with electrical equipment manufacturers, 1 per cent with the railroads and 15 per cent was exported.

THE IRON AGE questionnaire blank presented 30 industrial groupings. One company sold to all but one of these groups, another sold to all but five, but the majority confined their sales activities to a lesser number of groups.

The data compiled from the analyses submitted by machine tool builders are presented under the group headings which formed THE IRON AGE classification. A few companies did a fair volume of business with buying groups not included in our listing and added to their answers such lines as manual training schools, cash registers, typewriters, calculating machines, sewing machines, guns, die casting manufacturers, rubber shoe machinery companies, metal stamping machine manufacturers, steel furniture, jewelry, sporting goods, toys, moving picture equipment, cameras, optical goods, screw machine products, while others, though they may have sold to such groups, listed them under our miscellaneous classification.

THE IRON AGE classifications and the analyses which the figures suggest are as follows:

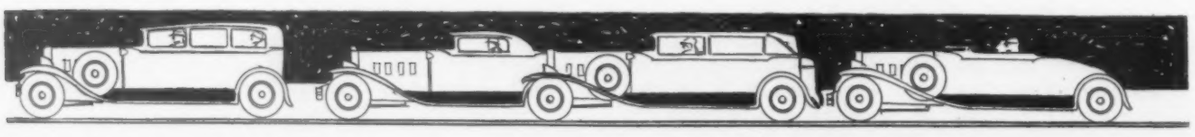
Automotive. — THE IRON AGE blank classified automobile manufacture and the manufacture of automobile parts and accessories separately, but a number of the machine tool builders apparently do not separate the two divisions of the automobile industry in their sales records and consequently make a consolidated return for both. Thirty-four of the 40 reporting companies sold machine tools to the automobile manufacturers. All of the 40 sold to the industry as a whole. For example, one company which reported no sales to automobile manufacturers direct did 25 per cent of its year's business with the makers of automobile parts and accessories.

In view of this situation in the returns, the figures for the two groups are considered together. The largest percentage of total sales to the automobile group was 80. Another company did 75 per cent, one 66 per cent, one 64½ per cent, one 63 per cent, two 60 per cent, one 56 per cent, one 52 per cent, one 51 per cent, one 48 per cent, one 46 per cent, one 45 per cent, three approximately 40 per cent, one 36½ per cent, one 32 per cent, one 30 per cent, one 29 per cent, one 26 per cent, and two 25 per cent.

Three of the 40 companies sold between 15 and 20 per cent of their entire output to the automobile industry, four did between 10 and 15 per cent, seven between 5 and 10 per cent and three less than 5 per cent with that industry.

Some 23 of the 40 companies did upward of 20 per cent of their year's business with the automotive group, and this does not include the aviation industry, for which reports were submitted separately. Taking the average of sales of companies reporting, the automobile industry accounted for upward of 30 per cent of all of the business done by the machine tool industry. Presumably, the result would be approximately the same if the averages had been weighted by sales in dollar values, considering that the returns came from large, medium-sized and small machine tool companies, thus representing an accurate cross section of the entire industry.

Airplanes and Airplane Engines.—Twenty-six of the 40 reporting companies received orders last year from the aviation industry. The company which apparently did the



largest business with this group attributes 10 per cent of its total sales to airplane and airplane engines companies. Another company did 8.87 per cent, one did 7 per cent, another 6 per cent and two did 5 per cent. The remainder received less than 5 per cent from such sources, three doing less than 1 per cent.

Agricultural Industry (and manufacturing for).—Thirty-five of the 40 companies sold to companies in this group. In some cases their volume was substantial. A company which tops the list credits 34.7 per cent of its sales to manufacturers of farm equipment and machinery, but did only 7½ per cent with the automobile group. Its second largest customer was the electrical equipment industry, with 17.1 per cent. Another company which did 30 per cent of its business in the farm group sold 40 per cent in the automobile field, these two groupings accounting for 70 per cent of its whole business. The remainder of its business was scattered among seven other groups. Another company did 28 per cent with the farm group and only 2 per cent with the automobile group, and 26 per cent of its business came from machine tool builders. The next highest figure in this group was 20 per cent, and there was one of 15 per cent and one of 13 per cent. Seven companies did 10 per cent of their business with the agricultural group, five did more more than 5 per cent but less than 10, five did 5 per cent, and the remainder, numbering 12, derived less than 5 per cent of their total business from this group.

Bottling, Canning and Food Industry (and manufacturing for.)—Only 14 of the 40 companies report sales to companies in this classification. One did 9 per cent of its total business with such companies, but the remainder report only small amounts, nine having done 1 per cent or less, while four did upward of 1 per cent but under 3 per cent.

Brass, Bronze and Copper Products.—This grouping likewise accounts for only a small portion of 1929 machine tool sales. Twelve companies sold to manufacturers in this field, but the highest amount was 2.61 per cent; there was one report of 2.20 per cent and one of 1.83 per cent. The other machine tool builders credit 1 per cent or less of their sales to this branch of industry.

Domestic Appliances (including electrical). — Nineteen machine tool builders of the 40 reporting received orders last year from manufacturers in this group. One company did 25 per cent of its total business with such manufacturers, which is the same percentage as it received from the automobile industry. This company did 10 per cent with electrical manufacturers, other than those making domestic appliances, and the remainder of its sales were divided among aviation, railroad, public utility, steel, textile machinery, radio and machine tool companies, with 5 per cent credited to each, the remaining 5 per cent having been export business. As compared with this company's sales to the domestic appliance manufacturers, other machine tool builders did not do so well. Two companies credit 10 per cent of their sales to this group, one 8 per cent, one 6 per cent, two 3 per cent, while the remainder did under 3 per cent, four of them less than 1 per cent.

Electrical Equipment (not including domestic appliances). — Thirty-seven machine tool builders report orders from this group, which includes such companies as General Electric and Westinghouse. Two credit 20 per cent of their sales to such sources, one 17.1 per cent, one 16 per cent, one 13.2 per cent, one 12.84 per cent, three 10 per cent, three 9 per cent, one 8.1 per cent, three 7 per cent, two 5 per cent, while the remainder, 18, did less than 5 per cent.

Railroads (own shops).—Railroads have not been the important factor in machine tool sales that many in the trade believe they should be, but nevertheless sales to the carriers bulk large with some companies, partly, perhaps, because of the fact that many of the tools the railroads buy are heavy types that run into large sums of money. One company sold 30 per cent of its 1929 output of tools to the railroads, another did 18 per cent, three did 15 per cent, one 13.7 per cent, one 11 per cent, one 10 per cent, one 7.11 per cent, one 5 per cent, while the remaining 16 did less than 5 per cent, some under 1 per cent.

Railroad Equipment Builders (cars, locomotives, etc.).

A SURVEY of the machine tool sales of last year, conducted by THE IRON AGE, reveals that the industries or consuming channels listed below apparently contributed the largest volume to the greatest number of companies. Returns were received from 40 representative machine tool builders. The figures show the number of tool companies which received business from each purchasing group and the average percentage of sales to each group, this average not taking account of those which made no sales to a particular group:

Purchasing Group	Number of Machine Tool Companies Reporting Sales	Average of Total Sales Per Cent
Automotive	40	30
Export	30	11.87
Agricultural	35	8.67
Machine shops (jobbing and miscellaneous)	21	7.71
Machine tool builders	27	6.90
Electrical equipment (Not including domestic appliances)	37	6.75
General machinery builders	24	6.53
Railroads	26	6.17
Steel companies	24	4.35

The average sales to some purchasing groups were comparatively high, as for example 5.92 per cent to builders of material handling equipment, 6.42 per cent to makers of tin and other metal containers and 5.57 per cent to structural steel, boiler and tank shops, but the number of companies sharing in such business was relatively small and the average was brought up in each instance because one or two companies had succeeded in developing a high percentage of sales, possibly because of some machines especially adapted to these various classes of shops. The rest of the year's machine tool business was widely scattered among many groups, as the accompanying analysis of the figures submitted to THE IRON AGE shows.

—This group apparently were not large buyers last year, although two machine tool builders attribute 10 per cent of their total sales to companies in this field. Twenty companies report having received some business from them. Two companies did 7 per cent. The remaining 16 did negligible amounts, a goodly number counting less than 1 per cent of their sales from such sources.

Building Supplies (including elevators, heating and plumbing goods, metal trim, builders' hardware, etc.).—One company reports having done 26 per cent of its last year's business among companies in the building field, mainly among makers of heating and plumbing goods. It is significant that this machine tool builder did 48 per cent of its business with the automotive industry, the two groups accounting for all but 26 per cent of its sales. Only 17 companies of the 40 reporting credit any part of their sales to this group of manufacturers. Eleven did less than 2 per cent, while the remainder did between 2 and 4 per cent.

Public Utilities.—Eleven companies report having made sales to this group. One attributes 12 per cent of its sales to the utilities, which, as classified by THE IRON AGE, include electric, gas and water companies, while one did 6 per cent, two did 5 per cent, one 3 per cent, while of the remaining six, five counted only fractions of 1 per cent of their sales in this classification.

Oil Producers and Refiners. — This was a productive field for three of the nine companies which report having received any orders from oil interests. One machine tool builder reports a total of 12.7 per cent of its sales to this field, another 12.61 per cent and the third 10 per cent. The others did amounts ranging from about a quarter of 1 per cent to about 1½ per cent.

Mining Companies.—The mining group was a negligible factor in machine tool sales. Only seven companies report having received any business from the mining field, and the amounts were all small, the highest 1½ per cent.

Steel Companies (primary producers).—The large steel producers are not generally counted as a leading source of machine tool business, but the figures submitted to THE IRON AGE are revealing as to the relative amount of business this group contributed last year. Continued expansion of steel plants and the tendency of all producing units toward cost reduction are undoubtedly factors in steel company purchases. Twenty-four machine tool builders got some business from this group. One company sold 20 per cent of its year's output to the steel companies, and in this classification fabricated structural steel shops were not included. Another company did 12 per cent, two 10 per cent, one 8 per cent, one 6 per cent, one 5.85 per cent, one 5.12 per cent, two 5 per cent, five 2 per cent, one 1½ per cent and eight did 1 per cent or less.

Fabricated Structural Steel, Boiler and Tank Shops.—Ten tool builders of the 40 reporting did business with this group. One did 15 per cent, one 11 per cent, one 6½ per cent, one 6.41 per cent, two 5 per cent, one 3 per cent, one 2½ per cent, one 1.2 per cent and the tenth did only a fraction of 1 per cent.

Shipbuilding Companies.—Shipbuilders were a poor source of business, though one of the six companies which report orders from this group attributes 5 per cent of its sales to the shipyards. Two reported 1 per cent, while the others were below that figure.

Textile Machinery Builders.—Twenty-five tool builders credit some part of their 1929 sales to the textile machinery trade. In general, however, the amounts were small. One company did 6.93 per cent, one 5 per cent, one 4 per cent, one 3½ per cent, one 3 per cent, one 2½ per cent, three 2 per cent, four over 1 per cent but less than 2 per cent, and 12 did 1 per cent or less.

Power Plant Equipment and Appliances (other than electrical).—Only four companies report business from this group. One did 2.9 per cent, another 2 per cent, a third 1.87 per cent, while the fourth did a small fraction of 1 per cent.

Industrial and Marine Motors.—One company reports that 3 per cent of its business came from this group, another did 1.33 per cent and a third 1 per cent. Only nine companies credit any of their business to companies coming within this classification, the remaining six reporting amounts under 1 per cent.

Material Handling Equipment (including trucks and trailers).—Eight of the 40 reporting companies did business with this group, but one company listed such sales with the building classification. One company did 20 per cent of its business in this group, another did 7.13 per cent, one 5.98 per cent, one 3½ per cent, one 3 per cent, one 1 per cent and one a fraction of 1 per cent.

Printing Trades (and manufacturing for).—Seventeen companies report business from this group, which includes builders of printing presses, linotype machines and other printing equipment. One company did 8 per cent in this field, another 4 per cent, one 3 per cent, one 2½ per cent, one 2 per cent, while the remainder, 12, did under 2 per cent, some only fractions of 1 per cent.

Scientific and Technical Instruments.—One machine tool builder sold 6 per cent of its 1929 output to manufacturers in this group, and others did 5½ per cent. Only eight reported any sales. Two credit 2 per cent of their business to this classification. The other five sold amounts varying from small fractions of 1 per cent to 1.26 per cent.

Radio Industry.—Twelve of the 40 companies reported having done business with this group. One company, however, listed such sales with domestic appliances. The largest amount of total sales credited by any one company to this group is 10 per cent. Another company reports 7.32 per cent, one 6½ per cent, one 5 per cent, one 3½ per cent, one almost 3 per cent, one 2 per cent, while the others did 1 per cent or less.

Tin and Other Metal Containers.—One company, of the five which reported having done business with this group, had the surprisingly large total of 30 per cent. The other four did small amounts, two 1 per cent and the other two fractions of 1 per cent.

Machine Tool Builders.—Figures sent to THE IRON AGE regarding sales to this group show that machine tool builders to a large extent practice what they preach, or, in other words, take their own medicine. Of the 40 companies reporting, 27 did business with other machine tool builders. Sales to this group accounted for a large part of the business done by some companies. One did 26 per cent with other machine tool builders, two did 20 per cent, one 10 per cent, one 9 per cent, one 8.86 per cent, one 8.1 per cent, one 6½ per cent, one 6.24 per cent, two 6 per cent, one 5.33 per cent, three 5 per cent, one 4.8 per cent, one 4.4 per cent, four 4 per cent, while six were under 4 per cent, but none less than 1½ per cent.

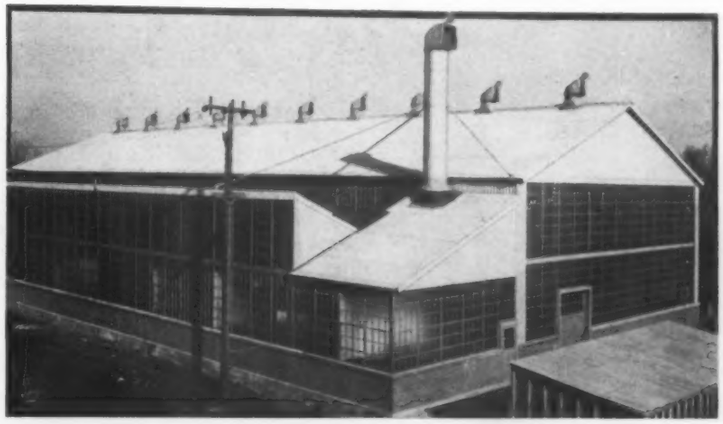
Machine Shops (jobbing and miscellaneous).—Twenty-one of the 40 reporting companies classify sales under this heading. The large percentages reported by a few, however, suggest that some machine tool builders may throw into this grouping a good many sales which other companies classify more definitely. One tool builder credits 30 per cent of its business to general machine shops, another 25 per cent, one 20 per cent, one 15 per cent, one 13 per cent, one 8.1 per cent, one 8.04 per cent, one 6.60 per cent, one 5.78 per cent, three 5 per cent, while nine report amounts under 5 per cent of their total sales.

(Concluded on page 1048)

Makes Rustless Steel Castings

Special Heat and Acid-Resisting Products From New Ohio Electric Steel Foundry—Centrifugal Pipe a Feature

A SPECIALIZED foundry for the manufacture of heat-resisting alloy castings, designed as a model plant for that class of work, has been built by the Ohio Steel Foundry Co. at Springfield, Ohio, and was recently placed in operation. The output will also include abrasive and acid-resisting castings.



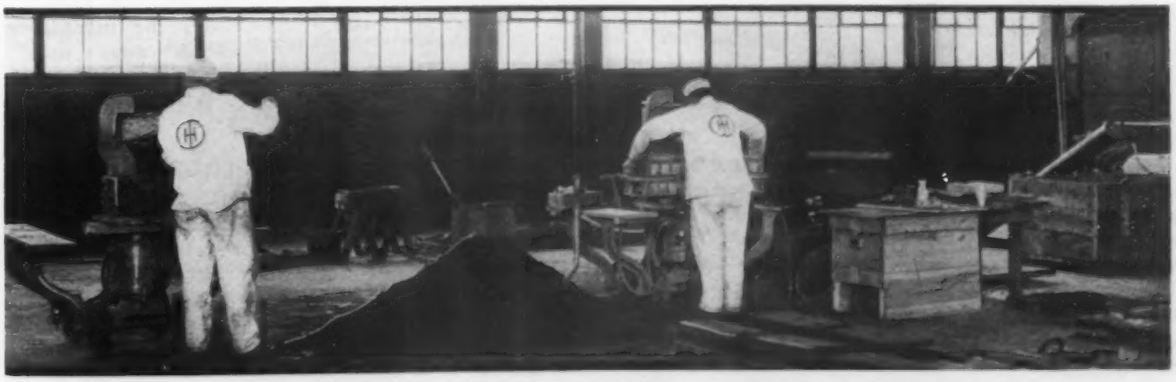
The foundry has a capacity of 100 tons of castings per month. The company operates one steel foundry at Lima, Ohio, its headquarters, where its melting is done in open-hearth furnaces, and another plant at Springfield which specializes on alloy steel castings, melting in this plant being done in electric furnaces.

Heat-resisting alloy castings were being made in the Springfield steel foundry but, in view of the special methods and practices followed in making this class of alloy castings and of their increasing use, it was decided to construct a foundry specially arranged and equipped for that class of work. A few years ago a 1000-lb. heat-resisting casting was rather unusual, but recently the company has made castings of this metal as large as 4 tons and is now equipped to make these castings from 8 oz. to 5 tons in size. Those of largest size will be made in the steel foundry.

Practices in making heat-resisting castings differ from those employed in the steel foundry in that greater care in molding is required. Owing to the comparative high cost of the metal, weight is cut down as much as possible. This is accomplished by the design of the pattern and the making of cored holes in the castings. A great deal of hand work is required in the making of molds and a close pouring temperature is necessary in order to produce castings equal in all respects to those made of ordinary carbon steel.

A centrifugal casting machine, designed by the company, for making pipe 4 to 16 in. in diameter, is included in the equipment. This is ordinarily made with a wall thickness of ⅜ in. but may be made with any heavier wall thickness desired. Two additional casting machines will be added, one for making larger and the other for smaller pipe than are made with the present machine.

The foundry building is a steel frame structure 200 ft. long and 100 ft. wide. It has a main bay 68 ft. wide. The crane runway on one side is set in 8 ft. from the wall, leaving space between the crane runway and the wall for the installation of a sand conveying system. On the opposite side is a leanto 32 ft. wide. The building is served by a 5-ton, 60-ft. span Alliance crane. Raw material comes in at one end and finished castings go out at the opposite end of a foundry conveniently arranged for routing. The alloying metals, chromium and



A Corner of the Molding Floor, the Molders Wearing White Uniforms

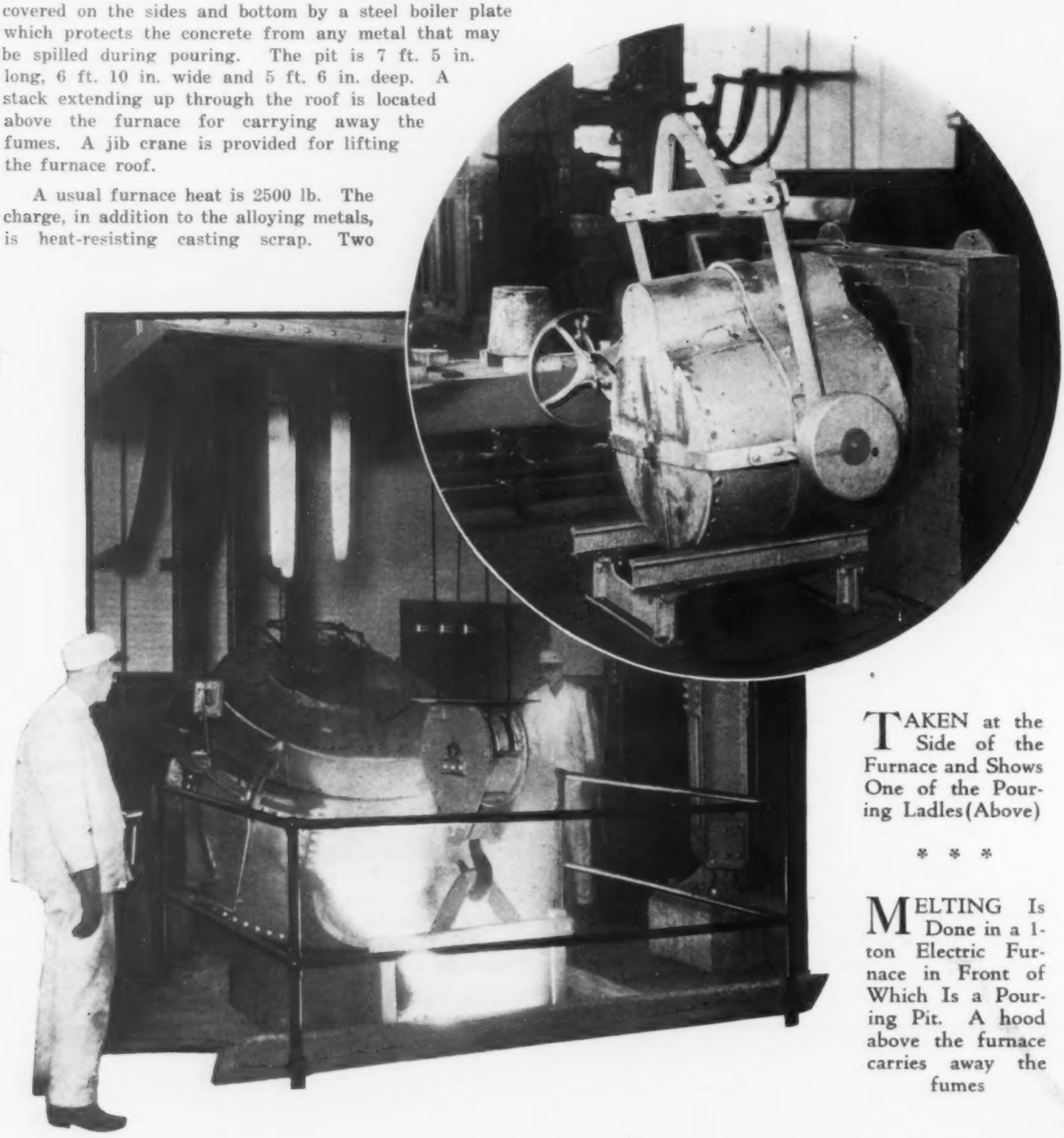
nickel, are stored in outside concrete bins located close to the foundry entrance.

Electric Furnace for Melting

Melting is done in a 1-ton standard type Swindell electric furnace located at the side of the main bay at the front end of the foundry. Metal is poured in a 3000-lb. capacity teapot, or a bottom pour, ladle. At the front of the furnace is a concrete pouring pit that is covered on the sides and bottom by a steel boiler plate which protects the concrete from any metal that may be spilled during pouring. The pit is 7 ft. 5 in. long, 6 ft. 10 in. wide and 5 ft. 6 in. deep. A stack extending up through the roof is located above the furnace for carrying away the fumes. A jib crane is provided for lifting the furnace roof.

A usual furnace heat is 2500 lb. The charge, in addition to the alloying metals, is heat-resisting casting scrap. Two grades of heat-resisting alloy castings are made, one containing 15 per cent chromium and 35 per cent nickel for resisting temperatures up to 2000 deg. Fahr., and the other containing 18 per cent chromium and 8 per cent nickel for resisting temperatures up to 1700 deg. Fahr. The two grades are designated as Fahrite No. 1 and No. 2 respectively. Another alloy containing as high as 25 per cent chromium and under 2 per cent nickel is used for making castings to resist high sulphur atmosphere and sulphide ore and zinc and lead oxides. This is designated as C. S. Fahrite.

Centrifugally cast pipe is made for the most part from the 15 per cent chromium, 35 per cent nickel alloy. The centrifugal machine is of the horizontal rotary type. It is driven by a 50-hp. slip ring motor, the speed of rotation being governed by the size of the tube being cast. The machine stands on a concrete foundation 13 ft. deep, being fastened by 2-in. bolts imbedded in the concrete. Sand cast tubes made of heat-resisting alloy are difficult to cast in sand, especially when thin sections are to be made.



TAKEN at the Side of the Furnace and Shows One of the Pouring Ladles (Above)

* * *

MELTING Is Done in a 1-ton Electric Furnace in Front of Which Is a Pouring Pit. A hood above the furnace carries away the fumes

More About Centrifugal Pipe

The quality of pipe made on the machine is superior to that cast in sand. It has a structure closely resembling a forging and is said to be free from blow holes and porosity. The outer surface is clean and smooth and the pipe is true to size as well as having a uniform wall thickness. It is not necessary to have excess metal to take care of the shifting of the core as is necessary when the pipe is cast in sand. With high-priced metal, this

CAR-TYPE Mold Drying Oven at the Right Is Heated from a Gas-Fired Combustion Chamber Back of the Oven, the Heat Being Delivered into the Oven by a Re-circulating Fan. The oven door, placed at a slight incline, is power operated

is an important factor.

The transformer room is back of the furnace in the leanto and is of sufficient size for the installation of electrical equipment for a second furnace. Current at 3 phase, 60 cycle comes in at 13,000 volts. The voltage on the furnace is 150 to 225. The equipment includes an Allis-Chalmers 1000-kva. transformer and a Pittsburgh Transformer Co. reactor. The switchboard is in the wall back of the furnace.

Gas-Fired Ovens Dry Molds and Cores

Molds are dried in a car type, gas-fired oven 18 ft. long, 7 ft. wide and 6 ft. high. The car has roller bearings and a sand seal. The oven door is placed at a slight incline and is operated by a motor above the oven. Gas, received through a 2-in. line, passes through two control valves, one for low temperature control and the other for high temperature control. The fuel passes at 11 oz. pressure into a combustion chamber back of the oven built by the Paul Maehler Co. and having a capacity of 1,000,000 B.t.u.'s per hr. The heat is delivered into the oven by single speed re-circulating fan, passing through ducts at the sides of the oven into the chamber.

There are two gas-fired core ovens 12 ft. 6 in. long and 7 ft. wide. Cores are loaded on racks which are moved in and out of the ovens on lift platform trucks. The mold drying and core ovens were built by the Marshall Blow Pipe Co. The three ovens have thermostatic control, which was supplied by the Bristol Co. The

SAND Handling and Mixing Equipment Is Shown at the Right and the Cleaning Department at the Left

pyrometers are located in the roofs of the ovens. Temperature in the mold drying ovens is held within a range of 10 deg., 500 deg. Fahr. being the maximum.

Core and Molding Equipment

The core making department is located back of the core ovens, the benches being placed along the leanto wall. These benches have tables of 18 in. x 36 in. steel plates, ⅜ in. thick. Core making equipment includes two plain jolt, 12 in. x 14 in., core machines placed flush with the benches. Air is piped along the back of the benches.

Molding equipment includes a Herman jar type machine with a 3 ft. 4 in. x 5 ft. table and with a capacity for making molds for a 6000-lb. casting and two portable Milwaukee molding machines. Because of the character of the work, a large proportion of the molds are made on the floor. For pit work, a pit 12 ft. 4 in. long, 9 ft. 4 in. wide and 12 ft. deep, is provided. This is lined with steel plate.

Cleaning is done at the lower end of the plant in a 10 ft. x 11 ft. Pangborn sand blast, equipped with a dust collector outside of the building. Work is taken into the sand blast on cars running on an industrial track. Castings are ground on a 24-in. high-speed grinder, on a 20-in. Fox swing grinder, and on a Rotor Air Tool Co. hand grinder.

Molds are shaken out on the floor and the sand passes through a shakeout grate onto an apron conveyor which delivers it to a bucket-type elevator which discharges it into a rotary mixer. Molds are made in sand fairly high in silica, in order to assure smooth castings. New sand is added as facing sand. The sand conveying equipment was furnished by the C. O. Bartlett & Snow Co., and the mixer by the Standard Sand & Machine Co. After sand blasting and grinding, castings are weighed on a Fairbanks scale of 5000-lb. capacity located at the side of a door at the lower end of the plant through which the finished product is taken out and loaded on cars for shipment.

A metallurgical laboratory, in the leanto adjoining the transformer room, is equipped with an Amsler tensile and compression testing machine, an Amsler impact machine, a Bausch & Lomb microscope, a Hoskins furnace for experimental heating, Rockwell and Brinell hardness testing machines and a polishing and grinding bench for polishing specimens for metallurgical work.

Connected to the laboratory is a dark room for developing photomicrographs. The steel members forming the walls and partitions of these rooms were joined by arc welding. This laboratory is supplemented by a chemical laboratory in the steel foundry.

The foundry is of a substantial construction throughout and its height, ample window surface and ventilating facilities give assurance of its being a clean, light and well ventilated room for the workers. The building is 60 ft. high to the peak of the roof. With continuous glass above a 5-ft. brick curtain wall, it has 7000 panes of 14 x 20 in. hammered glass. Swartwout rotary ventilators above both bays provide ventilation. The floor is of 6 in. concrete reinforced with No. 9 road mesh and having Carey road expansion joints at the column centers. The roof is asbestos. The building is heated by forced hot air from three heaters supplied by the York Heating & Ventilating Corporation.

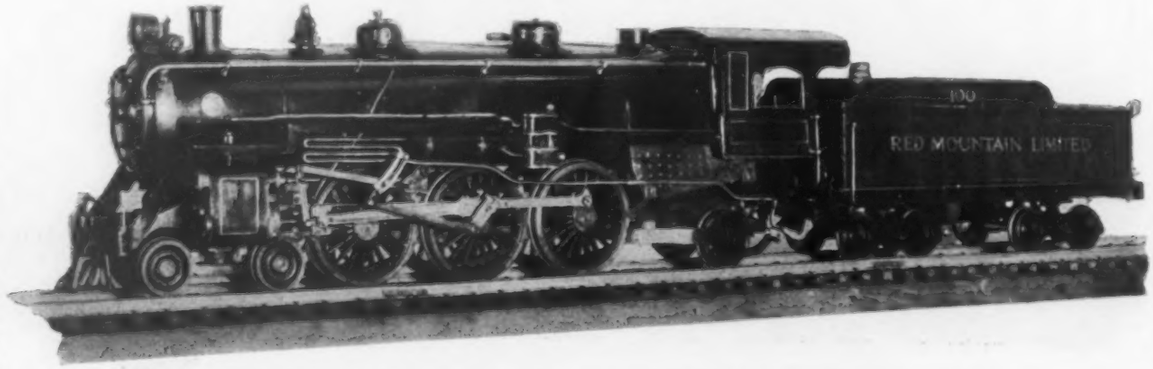
Interior painting helps to add to the bright and neat appearance of the foundry. The curtain wall is painted green. The building columns are green for five feet above the floor and the remainder in battleship gray. The furnace, ovens and stacks are the color of sheet aluminum, and the transformer room and laboratory are finished in white. In keeping with the general scheme of neatness and cleanness, the molders will wear white uniforms.

Types of Castings Produced

The product of the plant will include heat-resisting castings for furnace parts, conveyor links, pans, trays, valves, enameling bucks, furnace door arches, burner parts, super-heater supports, rolls for normalizing furnaces and lead, cyanide and salt pots. All ordinary alloy steel castings will be made in the present electric steel foundry that adjoins the new foundry. The various alloy steel castings made in this plant include special compositions for wear resistance, for strength and wear combined, for high strength, for resistance to corrosion.

Locomotive 40 In. Long Moves Under Its Own Steam

THE locomotive here shown is a model made by hand by F. B. Winslow, auditor of the Tennessee Coal, Iron & Railroad Co., Birmingham. It is only 40 in. in length overall. It weighs 27 lb., has a cylinder bore of only 11/16 in. and moves under its own steam. It is a miniature Pacific type oil-burner, built to a scale of ½ in. to 1 ft. It requires a track gage of 2¾ in., has 3½ in. drivers, 1¼ in. cylinder stroke, and its tubular boiler allows a steam pressure of 100 lb. to 1 sq. in. Its tender has a capacity of 1½ qt. of water and fuel.



Production Control Applied in Building Large Machines

BY RALPH E. MILLER

IN creating good will by meeting delivery promises, the production control system employed by the Chambersburg Engineering Co., Chambersburg, Pa., has proved highly successful. The same may be said of the reduction in manufacturing costs — achieved by increasing the productivity of equipment and decreasing inventory in materials and parts.

This control system is of interest also because of the fact that manufacturing at this plant approaches special order conditions, the most difficult of all to preplan. The standard forging and drop hammers, made in a number of types and in a wide range of sizes, as well as the nine or ten different mechanical and hydraulic presses for various uses, are built to sales orders only. Standardization and interchangeability permits the manufacture of many parts in stock quantities although no machines are assembled on stock.

The planning system is comprehensive; it takes in the purchasing and stores functions and ties up with the cost and general accounting systems. It is based on standards—engineering and plant—relating to materials, shop methods, unit costs and general procedure. All steps reflect appreciation of the fact that the forms and other mechanisms employed exist solely to facilitate production, which means that paper work has been made as simple as possible, although not to the extent of leaving unexploited any of its possibilities. The usual forms are used, also some that are unique in meeting the particular problems of this plant.

Planning Room Located in the Shop

The planning department is strategically located. It is in the shop—housed in a glass inclosure which faces the erecting department and has the light and heavy machine shops on either side, with the main storeroom and tool crib nearby. In the same enclosure is the office of the general superintendent (head of all operations, including planning) and that of the purchasing division, the function of which includes supervision of storeskeeping and of the "move gang."

Shop foremanship is organized along functional lines. All routine clerical work pertaining to production is done in the planning department, thus relieving the shop foreman and other executives of all paper work.

Finished parts are carried on hand to erect some 40 or 50 different sizes and types of standard products, together with an adequate supply of repair and raw materials. All stock is replenished at predetermined levels, indicated in some cases by the height of the material in the bin. For purchase of stock and non-stock materials, a list of vendors of such materials, and the minimum time that must be allowed to procure it, is kept in the purchasing division for use in scheduling orders as outlined below. Stores and stock ledgers are also kept in the purchasing division.

Shop orders are initiated by the order department upon receipt of a sales order. Four copies of the shop order are issued, one each for the design department, the planning department, the stores department and the accounting department.

The design department then issues a parts list, or bill of materials, together with the drawings, drawing list and specifications covering that order, these being sent to the planning department. A copy of the parts list is also forwarded to the accounting department.

Shop Orders Analyzed

Upon receipt of the shop order the planning department consults its file of Standard Operation Cards, Fig. 1. These are, in effect, combination route and schedule cards for each separate component of each machine made by the company. The data on each card are arranged according to sequence of operations, and include the overhead expense symbol for each machine, so that if a choice can be made the job will be assigned to the machine carrying the least of that expense.

From these operation cards the planning department is able to reduce the work represented by the order to time, and thus prepare a schedule. Starting with the delivery promise, and working backwards, dates are assigned for the production of each part of the machine on order. Along with this is specified the dates that raw material and purchased finished parts must be on hand for the work in the shops and in the erecting department.

With the latter schedule in front of him, the purchasing agent arranges accordingly for the delivery of the material from stores or from the vendor.

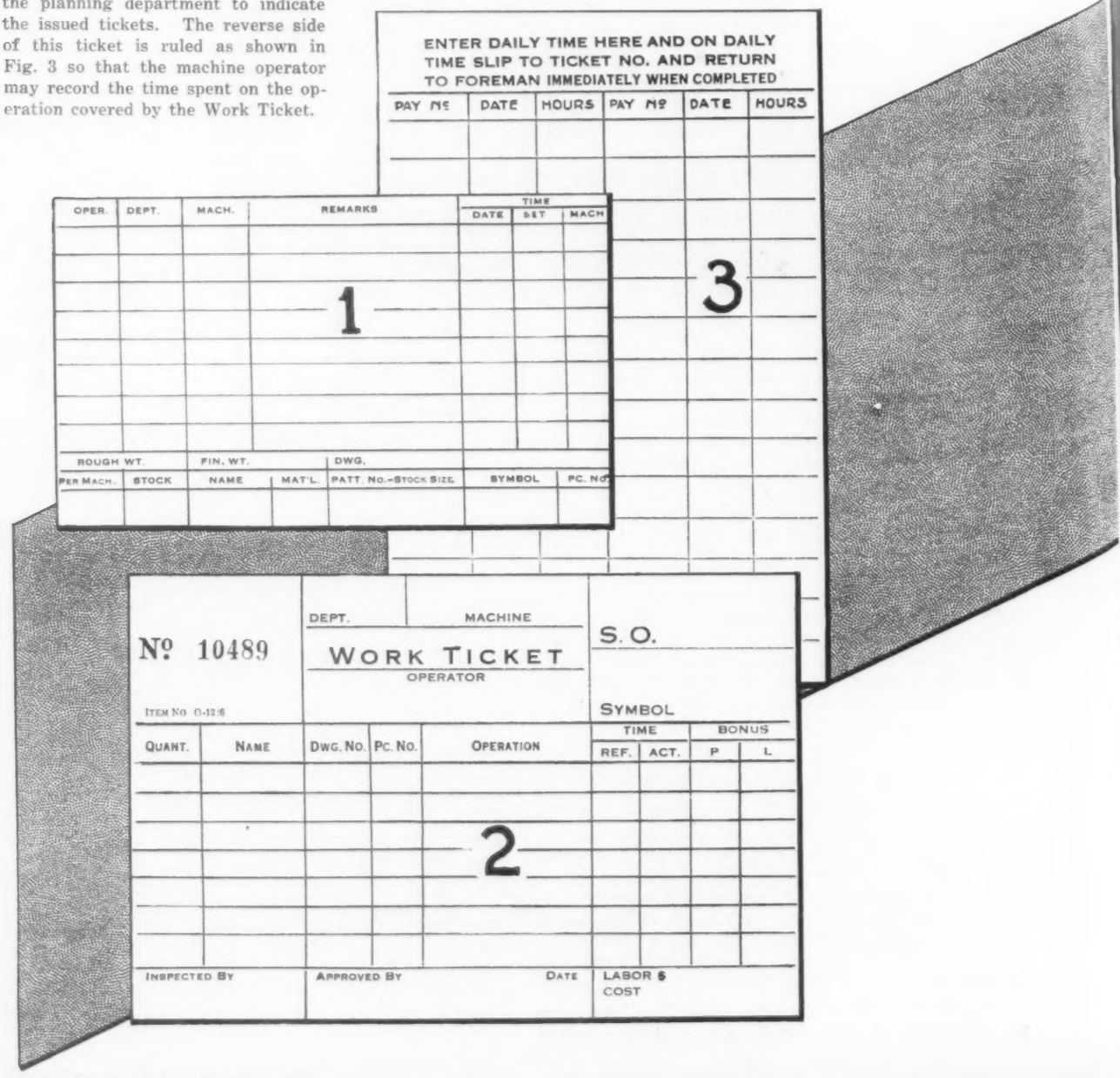
The above production planning is done on a control board (or a machine assignment board) consisting of a continuous sheet, resembling a Gantt chart, mounted on rollers. The chart is carried on a frame at the left of which is listed vertically all the machine tool and other production equipment, singly or in groups, in the plant. Horizontal lines represent time. Light horizontal lines indicate the number of hours required to perform the given operation assigned to each unit of equipment. Progress of the work is checked daily, and the availability of the machine tools and other shop equipment for subsequent orders is readily predicted. The feasibility of overtime work or additional labor is also indicated by this chart.

In the meantime the planning department has prepared Work Tickets, Fig. 2, covering each operation on each part to be produced. These tickets are made out in triplicate, the original copy being the operator's instructions to work on the given part; the second, or yellow, is forwarded to the accounting department, and the third retained in the planning department to indicate the issued tickets. The reverse side of this ticket is ruled as shown in Fig. 3 so that the machine operator may record the time spent on the operation covered by the Work Ticket.

With these tickets the accounting department has a complete cost history of every sales order, including direct material, direct labor and burden. It will thus be seen that the records forming part of the routine production control serve both cost department analysis purposes and production control. Costs of each machine in process are watched and carefully compared with "historical" costs of the same or similar work.

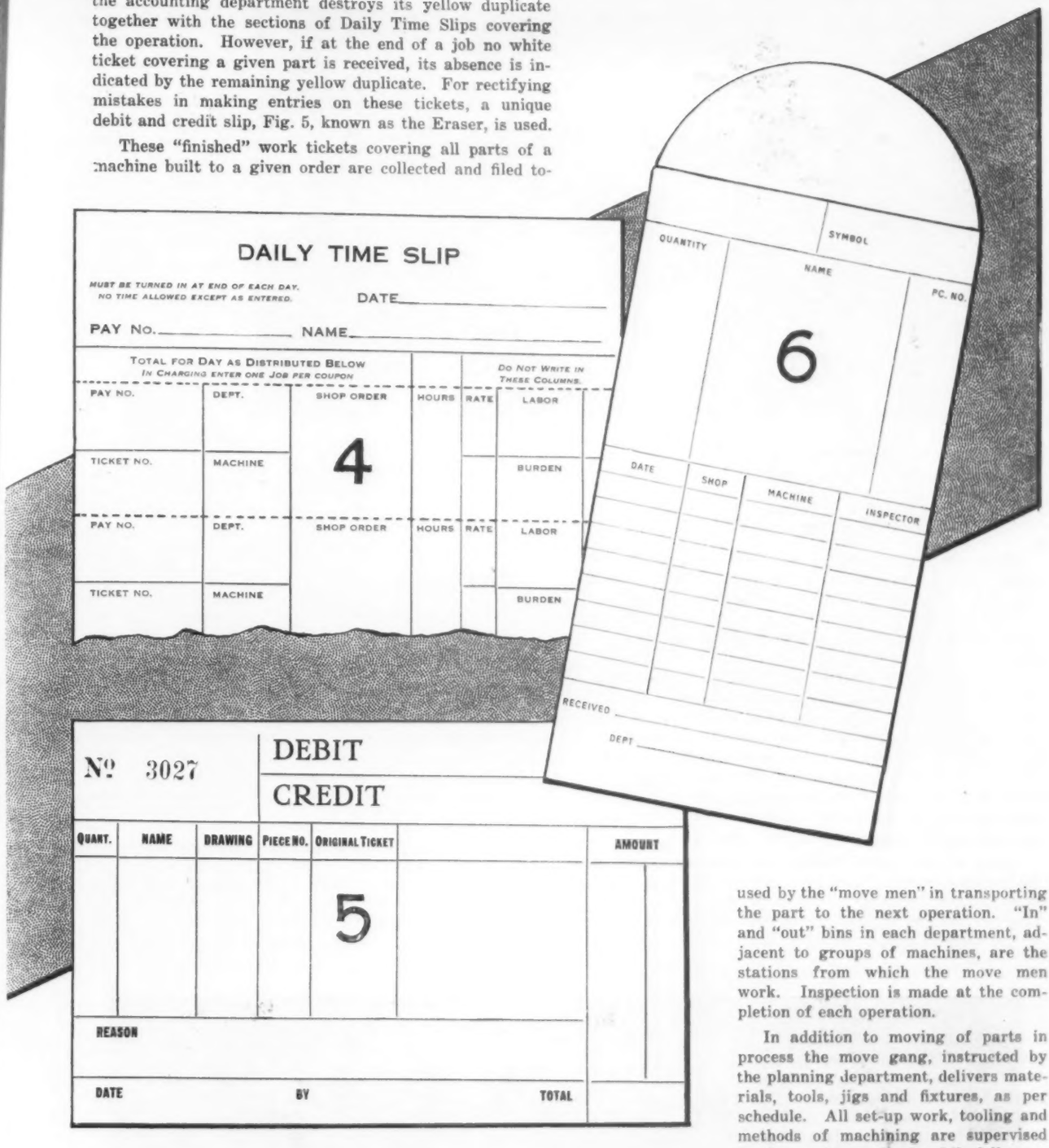
Because of the length of some series of operations, these Work Tickets with their time record cannot be returned to the accounting department at the end of a day or other definite period. Still, the general manager wants to know within 48 hours the cost history to date of each order in process. This is made possible by the Daily Time Slip, Fig. 4, which is made up of perforated sections that may be torn off and sent to the accounting department at the end of each day. These daily time slips serve also as a check against the time history on the Work Ticket, when all operations on a given part have been performed.

When the white Work Ticket is received from the shop,



the accounting department destroys its yellow duplicate together with the sections of Daily Time Slips covering the operation. However, if at the end of a job no white ticket covering a given part is received, its absence is indicated by the remaining yellow duplicate. For rectifying mistakes in making entries on these tickets, a unique debit and credit slip, Fig. 5, known as the Eraser, is used.

These "finished" work tickets covering all parts of a machine built to a given order are collected and filed together, forming a permanent record covering cost, etc., of the building of that machine. It will be seen that by means of the system used the production history of each machine built is known promptly, with minimum of records and clerical work, and most of that done in one centralized department—the planning room.



Route Tag Accompanies Work Through Shop

When the work ticket is made out in the planning department a route tag, or envelope containing blueprints, etc., Fig. 6, is issued, to be attached to and accompany the part in process throughout production. It lists the sequence of machine operations and inspections, and is used by the "move men" in transporting the part to the next operation. "In" and "out" bins in each department, adjacent to groups of machines, are the stations from which the move men work. Inspection is made at the completion of each operation.

In addition to moving of parts in process the move gang, instructed by the planning department, delivers materials, tools, jigs and fixtures, as per schedule. All set-up work, tooling and methods of machining are supervised by the master mechanic while follow-up of the shop schedule is the duty of the planning department. Machine operators are paid on day rate basis, with bonus for bettering the schedule time, all hourly employees receiving bonus based upon the earnings of the machine operators.

The scientific approach to production problems reflected from the above outline of the preplaning system is carried into the plant layout, which is arranged to assure the shortest and quickest travel of material in process. In fact a new wing, Fig. 7, has recently been added to the main plant to permit relocation of the heavy machine shop so that it is now immediately adjacent of both the light machine shop and the erecting floor, Fig. 9. In shortening the distance traveled by the heavy parts this

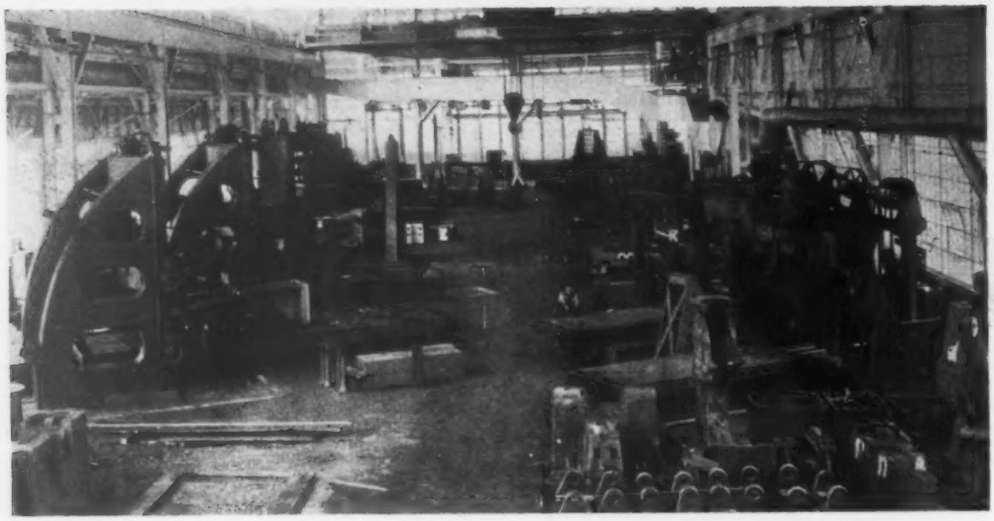


FIG. 7—The Addition of a New Wing Permitted Relocation of the Heavy Machine Shop, with Marked Economies in Expense of Handling Materials and Parts

relocation reduces power, labor and other expense incident to handling.

Pits Under Planers Facilitate Gear Removal

This new heavy machine shop is served by a 60-ton Shaw overhead traveling crane. Equipment includes a long line of planers, one of which measures 10 x 10 ft. between housings and another 12 x 10 ft. A layout plate, large boring mill, slotter, large engine lathes and a new Cincinnati-Bickford radial drill are among other machines. Pits are provided in front of the large drills to facilitate machining large pieces, and unique feature is the pits provided under the large planers. These planer pits extend the entire length of the machines and are some 10½ ft. deep; they are intended to permit access for convenient removal of gear assemblies, for renewal or repair. A standard gage track at one end permits removal of heavy steel castings by the 60-ton overhead crane direct from the cars on which they are shipped.

Some of the pieces handled are extremely large, as for instance, some of the parts of the 24,000-lb. steam drop hammer recently built for an Italian forge shop. This machine, to be used for engine crankshafts, is one of the largest steam hammers built for die work. It weighs 608,000 lb. and is 34 ft. 10 in. high, overall. When installed the height above the floor is 24 ft. 6 in. and below the floor 10 ft. 4 in. It is said that the energy available for work is approximately 5,807,000 in.-lb. and the heaviest blow struck is approximately 93,000,000 lb., or 46,500 tons.

Next to the heavy shop is the light machine shop (partly shown in Fig. 8), which is equipped with a large number of machine tools. Adjacent to a line of small and medium-size planers, several of new design, is a group of horizontal boring machines, including a new 5-in. Giddings & Lewis horizontal boring, milling and drilling machine. Engine and turret lathes, with bar stock storage racks, make up another group, and the line of column-and-knee type and vertical millers includes a new Mil-Waukee-Mil milling machine. Shapers, slotters and drilling machines of various types and sizes complete the equipment in this shop.

Operator's Name on Every Machine

To every machine throughout the shop is fastened a brass plate bearing the operator's name. Operators, by the way, are required to make their own set-ups. Most of them began their working life with the company, and

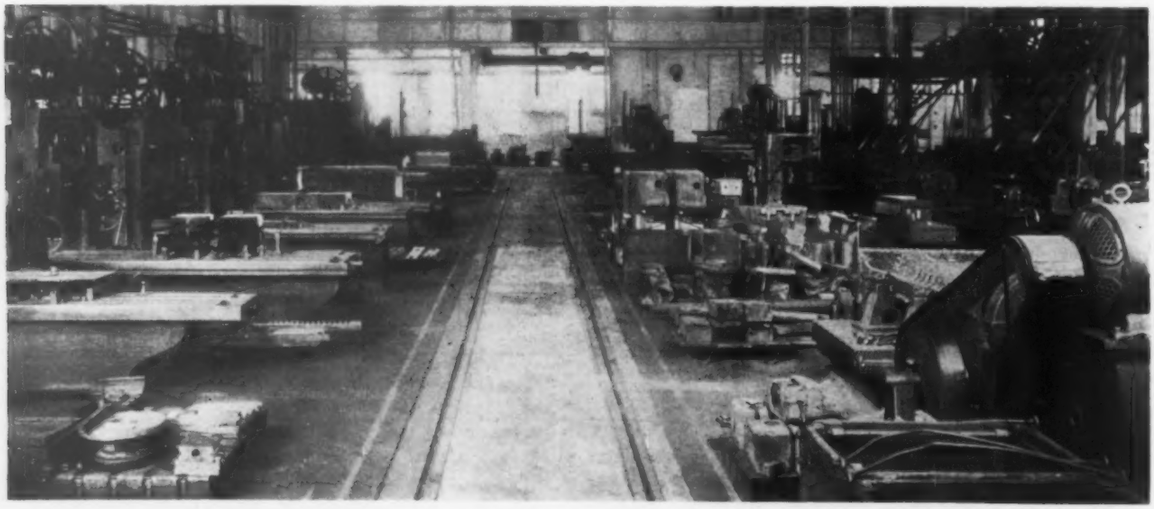


Fig. 8—In the Light Machine Shop, the Machine Tools, Many of Them of New Design, Are in Groups. Throughout the shop the operator's name is on a brass plate on each machine

two generations of the same family are not uncommon on the payroll. The company maintains an apprentice school in cooperation with the Pennsylvania State College. A baseball diamond and other recreation facilities, as well as a garage for employees' cars, are maintained.

A tool crib serving both shops is located behind the planning room and between the two shops, while the toolroom is located just beyond the erecting floor. In the next bay is the piston ring rolling and grinding and the pipe and bolt threading departments. Piston rings are made from straight strips of steel, which are bent to a circle, with the ends slotted and then ground to the correct size on a special machine.

The bays opposite the tool room and the piston ring departments are devoted to stock storage, while adjoining these is the main finish stores room. This is a large department, well day-lighted and having wide aisles. Bins and racks of special design make for good housekeeping and convenient handling of material; they are marked with plates showing maximum and minimum number to be stocked. The stores department is served by an overhead tramrail; in common with other parts of the plant it is heated by means of unit-type heaters.

Outside the storeroom is kept a limited stock of large and medium-sized parts, while in the yard between the main building and the foundry large castings, steel slabs and other heavy material are stored. This material is handled by a standard-gage locomotive crane, which unloads the large pieces from cars, shifts material around as necessary, loads heavy pieces on the plant gas tractors, spots freight cars and does other utility work.

Feeding the machine shop is the iron foundry, located in a separate building. Equipment includes three 20-ton air furnaces which can deliver 120,000 lb. of iron within an hour. These castings are for hammer frames, anvils and press platens requiring iron of carefully controlled analysis. Opposite these furnaces are two cupolas, 42 and 60 in., respectively. Core ovens, mold drying ovens, gas fired, are provided, as well as molding machines and other usual foundry equipment. Most of the molding is dry sand. Large as well as comparatively small castings are made here; recently a 160,000-lb. casting was poured.

Adjoining one end of the foundry is the pattern storage, a large building formerly occupied by the heavy machine shop. Next to the pattern storage is the pattern shop, also large, and well day-lighted.

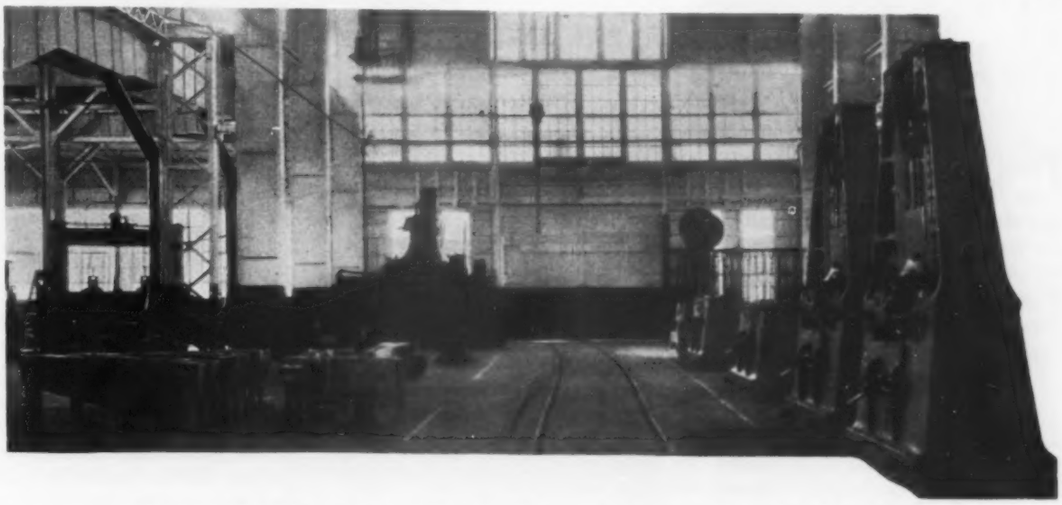


Fig. 9—Main Bay of the Chambersburg Engineering Co. Erecting Shop. This department adjoins both the light and heavy machine shops

The plant also includes a forge shop equipped with Chambersburg steam hammers, tool dressing hammers, punches and shears, and tool hardening furnaces. This shop is really an auxiliary to the machine shops; only light forgings are made, heavy forgings being purchased from outside commercial sources.

A research laboratory has recently been erected for the study of the flow of metal under impact and pressure and other fundamental phenomena affecting hammer design and maintenance.

Foreign Activities in Manganese

FROM an international viewpoint the discovery of a manganese deposit in Cape Colony, South Africa, was the principal event during 1928, according to L. A. Smith (Mineral Resources of the United States). The so-called Postmasburg area covers an unbroken line about 45 miles long and up to 1000 ft. wide. A geological examination of a 6-mile stretch indicates approximately 80,000,000 tons of ore of metallurgical grade, containing 42 to 58 per cent manganese. A 125-mile railroad from Kimberley is projected to serve the region, with the expectation that ore can be laid down in European or American ports for about $15 per ton.

Nearly all districts in India expanded their outputs in 1927, the total production for that country being 1,130,000 gross tons, three-fourths of which was exported and laid down in London at an average cost of $14.26 per ton. The geological survey of India estimated in 1904 that an annual production of 600,000 tons could be maintained for 30 to 40 years, about 50 to 70 deposits contributing to the total.

Other developments of interest are (a) the discovery of promising deposits in Persia and Russia; (b) the favorable development of deposits in Java; (c) the development of new deposits and the entrance of British and French capital into the Bahia, Matto Grosso, and Minas Geraes fields in Brazil; (d) the increased importation of manganese ores by France, and (e) the reentrance of Russian ores into the world market at reduced prices in August, 1928, following a period of inactivity that resulted from the withdrawal of the Harriman interests.

A New Method of Bright Annealing

Grünewald Process, Installed by Brown Boveri, Controls Atmosphere in Unique Manner, Suspends the Charge From the Pot Cover and Makes the Pot of Thin Alloy Plate

BY R. W. MILLER*

Fig. 1—Supporting Tray Partly Loaded with Coils of Wire Rod

DURING the present century great improvements have been made in every branch of the cold working industry. For instance the size of rolling mills have increased, the rate of rolling and drawing (especially copper) has been speeded, and a much higher degree of accuracy and quality is now expected. But the intermediate and final stages of the production of wire and strip, namely, annealing, has hardly kept pace with the general development. More than 90 per cent of the product is still annealed by the same clumsy methods which were in general use approximately 50 years ago.

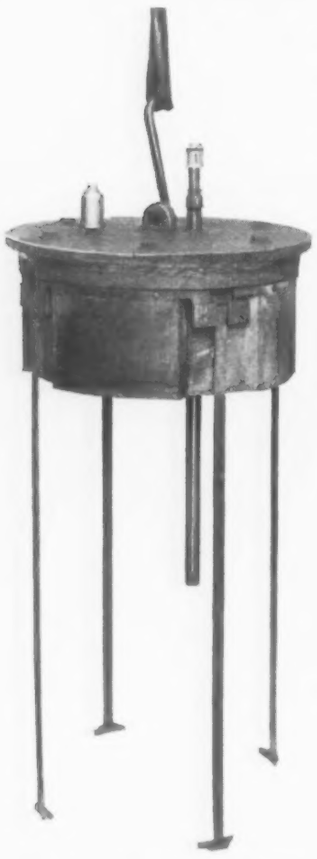


Fig. 2—Cover of Pot with Relief Valve, Pyrometer, and Suspension Rods. The skirt of the cover incloses a mass of insulation, to prevent escape of heat

The advent of the electric furnace has opened the way to new possibilities, particularly as regards the maintenance of a more uniform temperature. In America the continuous annealing furnaces for strip and sheet are commonly seen. But the problem of preventing oxidation of the cold rolled or drawn metal being annealed in continuous furnaces still has proved impossible of solution, except for the long lead furnaces and gas cooling pipes which are sometimes found in plants making the highest grade of spring materials.

When using the old methods for bright annealing metals in coils, such as filling the annealing pot with cast iron chips, the cost of electrical heating has proved prohibitive. Filling the muffle or furnace with inert, carbonaceous gas or hydrogen introduced so many inconveniences, additional costs and hazards from explosions, that wide use of this latter method has not yet been effected.

It has been known for a long time that in order to obtain a bright surface on the annealed goods it is only necessary to provide actual protection against oxidation while the charge is cooling down. The so-called Vitry method, for instance, depends on this fact, but since it involves the use of an inert gas, it has not been adopted extensively either in America or in Europe.

It remains therefore that the widest used method for bright annealing thin wire and strip involves loading the coils into a pot or on a car body, heaping them over with cast iron borings, sealing the cover, and running the charge into a gas, oil or coal-fired furnace. Seldom does the weight of the metal to be annealed reach half the total weight of the furnace charge which must be heated. Obviously this involves great waste in both fuel and time. Its greatest advantage is that it is fool-proof—that is to say the coils come out of the cooled receptacle without scale on the metal, even though the uniformity of the softening and other internal metallographical changes may leave something to be desired.

New Pot Carries No Load

In order to avoid the admitted disadvantages of heating in cast iron chips, Brown Boveri & Co., Ltd., have installed the Grünewald system of bright annealing in their shops at Baden, Switzerland.

This method like that of Vitry also depends on protecting the metal during the cooling part of the annealing cycle. Instead, however, of using inert gas to prevent air from reaching the contents, the annealing pot is rendered air-tight when the maximum temperature is reached, the principle being similar to that used for preserving fruit and other food stuffs.

Constructionally the Grünewald pot differs from all previously used types in that it does not stand on the bottom of the furnace but is suspended inside it from the top. Also, the charge is not laid directly in the pot, but is carried on a special tray suspended from the cover by means

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of rods, the cover also serving to close the furnace. These new features are responsible for the following advantages:

1. Since the hot annealing pot is stressed only by its own weight, it does not need to be made strong and bulky.

2. The seal of the annealing pot is not in contact with the source of heat, and therefore an absolutely air-tight joint can be made in the simplest manner.

3. Part of the heat stored in the charge and in the pots can be recuperated without the use of expensive equipment.

The economic advantages are obvious. Instead of making the pot walls 1 in. thick out of cast steel or special plates to resist temperature up to 750 deg. C., the castings can be made of ¼-in. boiler plate. This reduction in the dead weight to be heated alone enables a 15 to 20-per cent saving in the current consumed. The thin walls also offer much less resistance to the passage of heat; therefore the productive capacity of the furnace is very appreciably increased. In general the annealing pots used in electric furnaces have a longer average life than those used in other types of furnaces, and the life of the Grünewald pot is still further increased from the fact that it can be used until it becomes so thin as to be no longer air-tight, that is to say, ⅛ in. or less. Even then it is necessary to replace only that part of the casing which is exposed to the heat of the furnace and therefore subject to oxidation, while the cover lasts indefinitely. Therefore the cost of repairing a Grünewald pot is barely one-quarter the cost of replacing a cast steel pot, placed wholly inside the heating chamber.

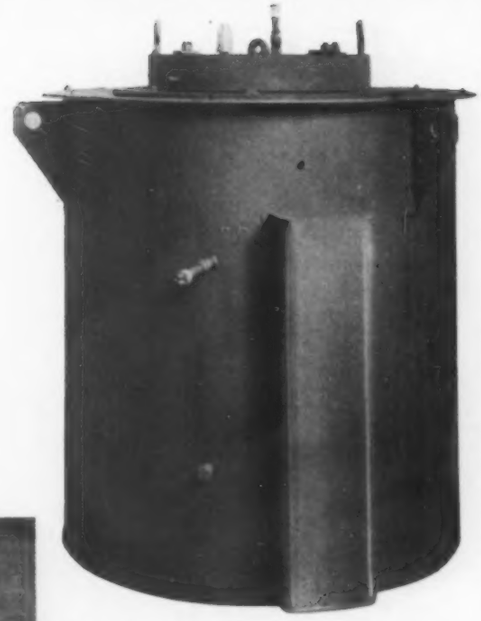


Fig. 5—Electric Annealing Furnace (Grünewald Method). Sheet iron jacket surrounds refractory lining and system of heating elements. Pyrometer tubes protrude through casing; power connections are contained in side guard

Fig. 3—Adjusting Suspension Rods Between Load and Cover

Fig. 4—Load Lowered into Annealing Pot and Cover Clamped Down

Many have found that special alloys are most economical in ordinary heat treating service, despite their high first cost. When pots are made which support their own weight only, and to resist the collapsing force of the partial vacuum during cooling, even the first cost becomes moderate. The thin walls, low weight and the fact that the surfaces of a corrosion resisting alloy are always free from oxide, allow the charge to be heated up and also cooled down in a much shorter time. Thus the number of annealing pots required for a given production is much smaller. Fewer furnaces are also required, so that, neglecting the saving in floor space, the total cost of the furnace plant at the Baden works, complete with annealing pots, was less than the estimates for other plants having the same production, even when using a comparatively expensive nickel-chromium-iron alloy known as "nicrotherm" for the pots. Trays and suspension rods (in fact all interior fittings) are made of carbon steels, for they are of course immune from scaling.

The annealing pots themselves are sealed as a housewife seals preserves or fruit, namely, by means of a rubber ring placed between the top rim of the container and the lid. The rubber ring is cooled by water circulated in a groove in the cover, and can be used hundreds of times.

The process of bright annealing wire and strip at the Brown Boveri plant is as follows:

Pot Sealed at Hottest Temperature

The coils are first laid on the supporting tray (Fig. 1), the cover and its suspension rods (Fig. 2) are held over the load by the crane, and the rods are attached to the tray (Fig. 3). The cover is now lifted, together with the charged tray, carried to the pot, lowered into it and the cover tightly clamped down. (Fig. 4). By this means a uniform pressure is exerted on the whole of the rubber

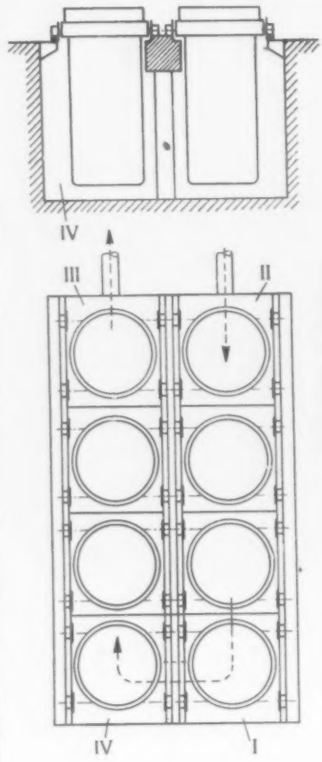


FIG. 6 — Recuperative Cooling Pit. Hot pots enter at I and progress toward II. Cold pots enter at III and progress toward IV. Air current shown by dotted line

ring, and an air-tight joint made between the pot and cover from the beginning. The groove around the edge is filled with cooling water before bringing the pot to the furnace. The pot can now be lowered into the furnace casing (Fig. 5) and heated up.

A large part of the air in the pot is expelled through the relief valve, shown on the cover, as the charge heats up, and because oil and grease on the metal is carbonized and vaporized. The oxygen in the remaining air is used up in burning part of the oil vapor, so that the annealing pot is entirely free from oxygen long before the oxidation temperature of the iron is reached. The pressure in the pot drops after the peak in temperature is passed and the relief valve then closes automatically, but for safety the valve can be screwed down tight when moving or cooling the pot.

When the desired annealing temperature and time has been reached, the pot is lifted out of the furnace by the crane and hung in a cooling pit where it cools in 12 to 20 hr. The tight fit of the cover and the valve prevents any air from entering during the cooling process, so that a vacuum up to 400 mm. of mercury may be attained at the end. Ordinarily the valve is opened when the temperature has dropped to the value required for bright, blue or black dull annealing (whichever is desired) and the charge, still suspended from the cover, is lifted out of the annealing pot. The supporting tray is now placed on the floor; the suspension rods are removed and immediately fitted to another tray, ready loaded with a fresh charge.

Several kinds of metals beside iron and steel have been annealed in this equipment. When treating metals which oxidize at a very low temperature, it has been found necessary to remove all oxygen from the pot at the start, and the simplest way of doing this is to throw in a small quantity of glowing charcoal just before sealing the pot.

Figure 6 shows the arrangement of the cooling pits for regenerating heat from the cooling pots. The power saved by this means approaches 40 per cent of that required for heating a cold charge. The number of pots cooling in the pit varies according to the production and to the cooling speed required. The hot pots are suspended from a square cover plate having four wheels running on rails on the walls of the cooling pit. Hot pots enter at position I. As each fresh pot is run into the pit, the whole row is moved up toward position II. The pots containing wire for annealing enter at III and move in the opposite direction, in a parallel line. Warm pots removed at IV are ready for the electric heating furnaces shown in Fig. 5.

A current of air enters the pit at II and flows through it in a direction opposed to that in which the pots move. It cools the pots, thus heating itself, enters the warming pit at IV, flows over the cold pots and leaves at III at a much lower temperature, but still hot enough for heating the building in winter.

One advantage of the plant at Baden is that the annealing furnaces are located in the same building as the cold rolling mills. This arrangement saves much transportation, one overhead crane doing all the work. Such a scheme can obviously be adopted only when electrically heated furnaces are employed; as a matter of fact, the Grünewald process would probably be unattractive unless electric furnaces were available.

Furnaces used by Brown Boveri, sketched in Fig. 7, have a low current consumption and precise temperature control. Heating elements are divided into two or three intertwined sets, according to the size of the furnace, and the current is regulated in an automatic manner. One set of elements is connected directly to the power mains through proper knife switches, while the others are controlled by automatic equipment connected to pyrometers both inside the pot and outside the pot among the heating elements. Such a plan enables maximum power to be put into the furnaces at an early stage in the heating, subject only to the proviso that no part of the charge becomes overheated nor the temperature "over shoots" at any time. Proper wiring and control thus enables the metallurgist to set any desired time-temperature curve on the heating and annealing cycle, with the assurance that his intentions shall be achieved.

A metal which has been uniformly and completely bright annealed at the theoretically correct temperature can obviously be machined or formed better and heat treated with greater accuracy, and it is then only that all the advantages of the new methods of rolling and drawing can be fully utilized and the work of these departments made as economical as possible.

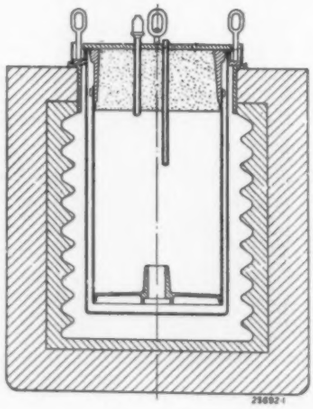
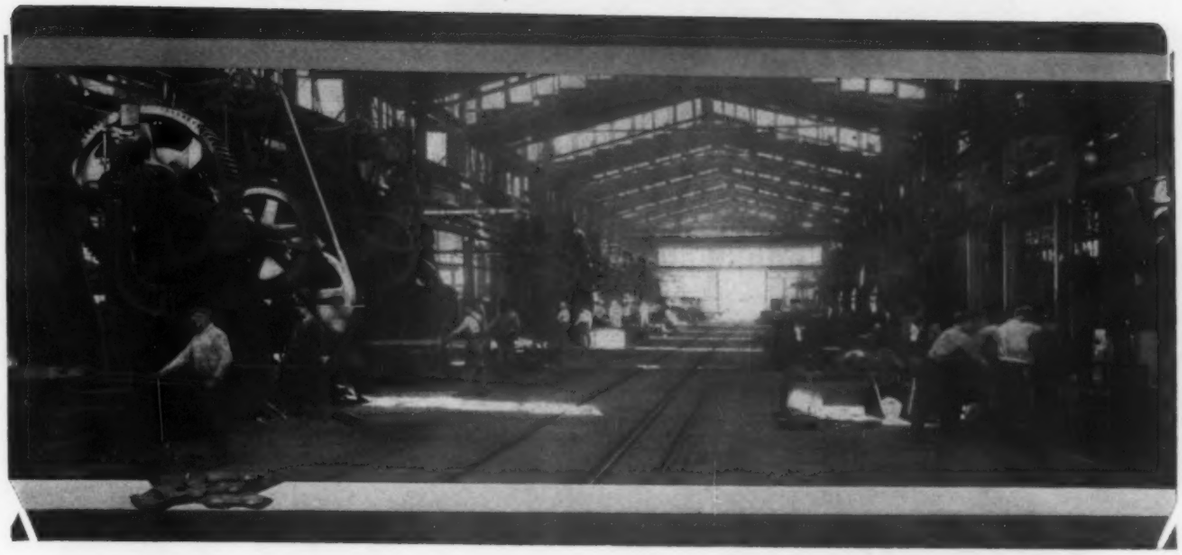


Fig. 7.—Cross Sectional Diagram of Grünewald Annealing Pot and Furnace. Heating elements (coils of resistance wire) are placed in grooves in inner refractory lining



Large and Unusual Drop Forgings

Massive Pieces Weighing Several Hundred Pounds Made in Single Pair of Dies—Longer Pieces Drop Forged to Shape on Ends or at Center

A CONSTANT increase in the number of drop forgings placed on locomotives, as substitutes for steel castings and machined hammer or press work, is a matter worthy of note. Another interesting point observed at the Baldwin Locomotive Works, Eddystone, Pa., is the great weight of some of these forgings—ranging up to 700 lb.—and the corresponding size of the die blocks.

Economical Production in Small Numbers

Present practice is the result of a continuous development of several years, during which time a considerable number of dies has been accumulated. Perhaps the first use of drop forgings was for steam flanges and other pressure castings of small size. Forgings are much tighter than castings, and it causes vexatious delay and unwarranted expense to have an apparently sound fitting develop a steam leak on the test track or shortly after entering service. Substitution of drop forgings rapidly justified itself economically, not only because they avoided these occasional expenditures, but because the percentage of rejects after machining was cut down, the machining limits reduced, and the ease of machining increased—all factors which rapidly extinguished the cost of the dies.

Commencing with the more obvious things, like flanges, clevis ("boiler jaws"), keys and links, the size and variety of drop forgings has increased to include equalizer bars and spring hangers such as shown in Fig. 2. Now bell cranks weighing several hundred pounds are made as a matter of course. Even more massive pieces are now roughed out under a steam hammer, and each end or a portion of the center finished to close shape by a succession of blows between proper dies.

Ordinarily, dies would be cut only for parts of such dimension that they would probably be used on future locomotives of similar power. Such a part would then become a Baldwin standard—drawings of it would be included in all the draftsmen's and engineers' data books, and it is their duty to use this shape wherever possible in layouts for new engines. Of course, many railroad superintendents design their own motive power and it is a matter of diplomatic suggestion to get them to use these standards, with hints of quality and economy to be gained by the use of available dies. A sizable engine order—say 25 locomotives—would warrant the cutting or alteration of dies for many of the parts repeated say six times or more on each unit.

Die Blocks Have Relatively Small Production

It is obvious that this practice has certain fundamental differences from the drop forging of carpenters' tools or builders' hardware due to the fact that an average order may amount to 200 pieces, instead of as many thousands. This means that expensive alloy steel dies are not justified, even though they undoubtedly would have a long life. A carbon steel, more easily cut or resunk, yet hard and tough enough to forge several thousand pieces, is a more economical choice. For that reason, the dies at Eddystone are blocks of plain carbon, acid open-hearth steel, made and heat treated at Burnham, Pa., in the plant of a Baldwin subsidiary, the Standard Steel Works Co. A scleroscope hardness ranging from 38 to 43 is regarded as correct.

The toolroom at the Eddystone forge shop is adequately equipped with modern die sinking equipment, and for occasional hardening or toughening jobs, heating furnaces and quench tanks are available in the forge shop. Tool makers are company employees, rather than contractors,

Fig. 1—Manufacture of Equalizer Bar. Original 5 x 7 in. billet at right, rough shape from steam hammer in center, completed drop forging at left. Forging and trimming dies at the rear

forge department, reheated, and forged in the dies shown in Fig. 1. These dies would be cut to correct shape, with the ordinary taper for draft. On account of the liability that some of the bars may be considerably oversize, the flash grooves are wider and deeper than in ordinary drop forge practice, being as much as 3/16 in. deep in the top die. Such heavy forging would be done on big hammers as shown in Fig. 3.

When the flash groove is filled, the hot forging is removed to an adjoining press or hammer, equipped with the correct trimming die. If the flash cut off is too thick, and the piece a corresponding amount oversize, it is immediately reforged and retrimmed. Final machine work on such a bar is

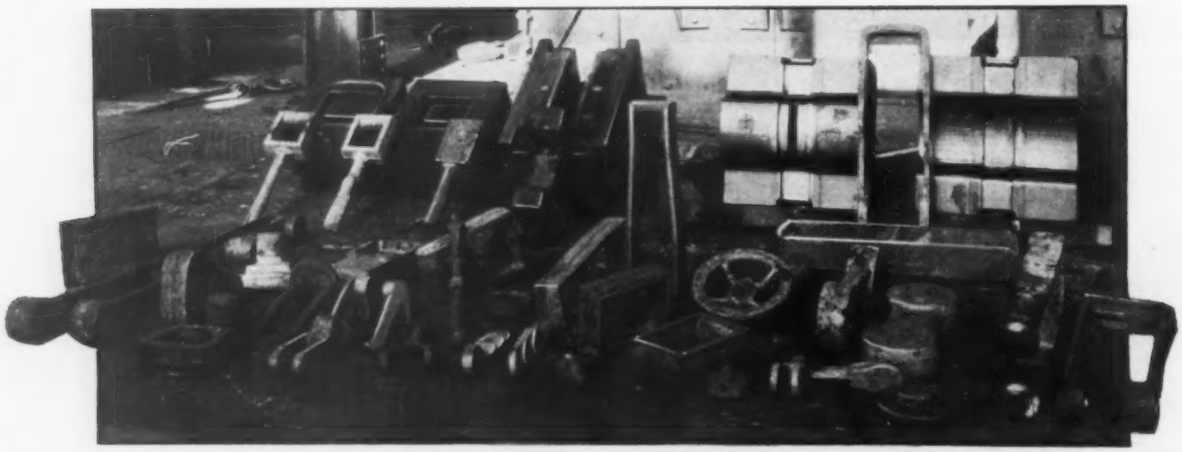


Fig. 2—Representative Assortment of Drop Forgings from a Day's Work. At left is pair of dies for small hangers. At right is pair of dies for forging rib into central portion of long stirrup

since the work is so diverse that standards of performance would be difficult to establish.

Remarkably satisfactory service is secured from these carbon steel die blocks at Eddystone, considering the fact that blanking and finishing dies are seldom prepared. In nearly every instance all the work from a plain bar, or a blank roughly formed under a steam hammer, is done in the finish die and the trimming die. If there is too much stock in the blank, the piece must be restruck after trimming, still in the same die. Not only must one die do all the work, but many of the forgings are made of medium carbon steels, with 0.35 and even up to 0.55 per cent, which cannot be heated as "soft" as the hammer man would like without running the danger of burning.

Roughing Frequently Done on the Anvil

Some of the more interesting heavy work has been photographed. One shows the development of an equalizer bar. Six of these would be used on an engine of the 2-8-2 type (the number depending on the number of driving wheels). It starts from a square billet 5 in. x 7 in. x 25 in. long, and the original roughing is done under a steam hammer into the approximate shape required. In former practice, this hammer work would be done with much more care as to finished shape, but the bulk of the work of getting it to exact size would be done in the machine shop.

Now, the rough forging is transferred to the drop

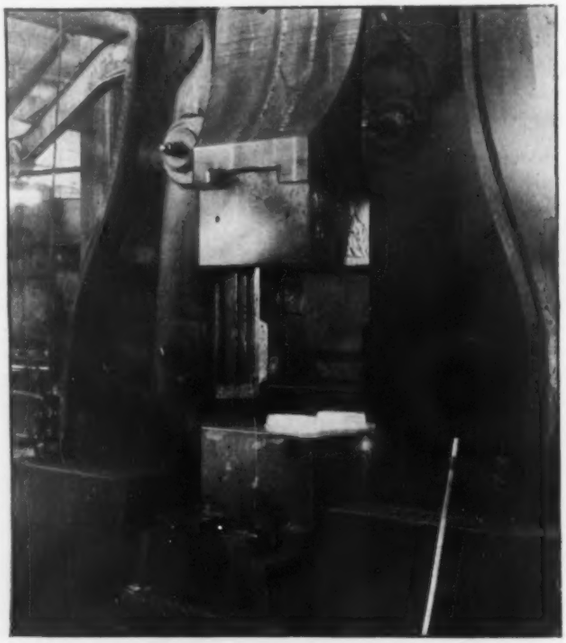


Fig. 3—A 7500-lb. Steam Drop Hammer Forging a Heavy Link

merely the surfacing of the bearing bosses, to remove the taper given them in the die, and cutting the necessary channels or grooves to fix the location of hangers or other attachments.

Long Pieces Drop Forged at Ends

A combination of several methods of hot working is used for the economical production of heavy stirrups known as "driving spring links" as shown at the right of

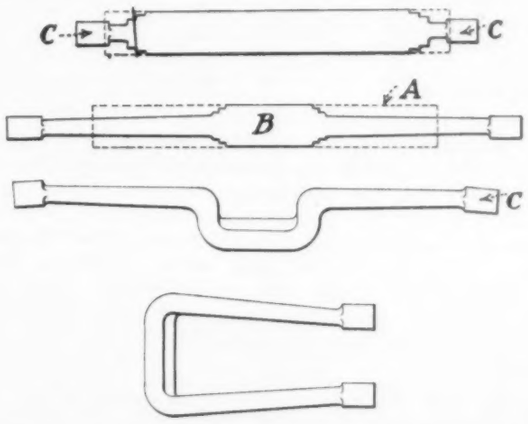


Fig. 4—Various Steps in Drop Forging Large Stirrup Too Big for Single Die

Fig. 2 and sketched in Fig. 4. This starts as a bar 3½ in. x 2¼ in. x 3 ft. long, *A*. The first operation is flashing one end into a head or boss, which operation also finishes about 4 in. of the leg. Next the other end is similarly treated. The two ends are then drawn down under an 800-lb. steam hammer into tapered arms, leaving about 8 in. in the midlength *B* at its original dimension. Then the central portion is drop forged into a ribbed channel. This central portion is then reheated and the two ends

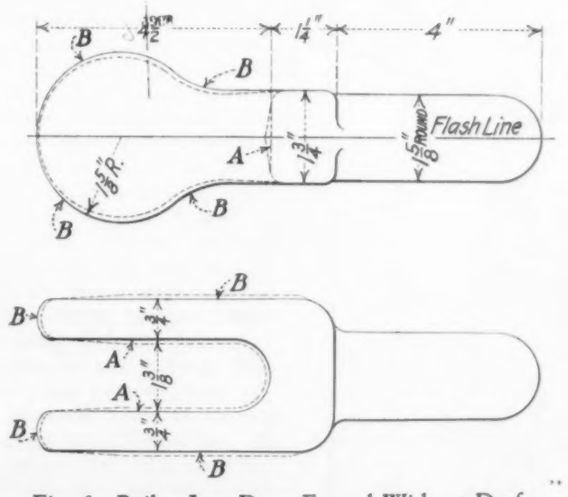


Fig. 6—Boiler Jaw, Drop Forged Without Draft

bent up into a stirrup of correct shape between proper mandrels in a hydraulic press. No machine work other than drilling the pin holes is then necessary.

Two other examples of finished pieces, drop forged in sections, are shown in Fig. 5.

Drop Forgings Without Draft

An interesting variation of standard operations has been devised to manufacture iron boiler jaws which need no machining other than to drill a pin hole in the ends. This jaw is really a clevis, and is welded to the end of the long stay rods inside the boiler. It starts with an 8-in. piece of 2½-in. square iron at a forging heat. First one end is flattened to about 1½ in. by two strokes of a 2000-lb. steam drop hammer, the smith holding the iron between the flat edges of the top and bottom die. The piece is then placed edge up in the lower die and is struck four or five times, turned over and struck again. It is then removed to an adjoining toggle press and the outer flash trimmed off.

It now has the shape sketched by the dotted lines in Fig. 6, and with generous angles to provide easy draft. In order to produce jaws with parallel faces, without the necessity of machining, the trimmed forging is then dropped into a deep, snugly fitting recess in the press bed and a parallel sided punch fixed to the upper head of the press descends, at one stroke cutting out the inside flash

Fig. 5—Yokes and Links Drop Forged at Either End

and trimming off the taper, due to draft, back to the parallel sided slot *AAA*.

The draft on the outer side of the clevis is then flattened by slipping the jaw over a bent tongue in the center of the press bed, and giving one squeeze. The top and bottom platens are set the correct distance apart so that the overall dimension of the jaw is correct. The extra metal, flowing sideways, swells the piece somewhat to the shape given in the full lines *BBB*, but this has been provided for by cutting the original die undersize.

Air Ship Proved Sound by X-Ray

As an instance of the practicability of using X-rays as a shop inspection tool, V. E. Pullin, director of radiological research, Woolwich Arsenal, England, cites work done on the airship R-101. In a recent article in *The Engineer* he describes the use of a high power Roentgen tube, mounted on the rolling stagings used in airship sheds, and suitable for examining important joints at any height up to 60 ft. from the ground. Sensitized paper was used and each radiograph developed on the spot. The soundness of the joints was in this manner proved beyond all question.

The training of foremen as practiced by the American Rolling Mill Co., with particular reference to making the foreman accept the attitude, if not the responsibilities, of managership, was discussed at length in THE IRON AGE of March 13. Reference was made in the article to certain outlines which guide the course of study. Anyone who would like a copy of these outlines may obtain them by writing to Hugh W. Wright, supervisor of personnel publications of the company, Middletown, Ohio.

Steel Wages Under the 8-Hour Day

Government Figures Show Metal Working Trades Continue to Be High Wage Industries— Accident Rate Decreasing

BY MARSHALL OLDS

STEEL for many years enjoyed the reputation of being our highest wage industry. Judge Gary once testified that American steel workers were paid, as far as he could learn, the highest wages in the world. Many people have thought that this was largely due to the 12-hr. day. Twelve-hour work in the steel industry was never as extensive as the public was led to believe and was abolished 6 years ago by placing necessarily continuous furnace operation on a straight three-shift basis and eliminating all 12-hr. work from all other departments. It is thus pertinent and should be interesting both to steel makers and to the public to know the facts as to steel wages under these new conditions and to compare steel wages with those of other industries now.

The United States Bureau of Labor Statistics makes the most exhaustive and detailed studies of wages and hours of labor that are available and is doubtless the recognized authority as to facts in this field. It has made four such studies of the iron and steel industry in recent years, in 1922, 1924, 1926 and 1929, its 1929 figures having only recently become available in the *Monthly Labor Review*. The 1922 figures represent conditions under the old two-shift system; the 1924 figures represent conditions just after the change to three shifts, or short shifts, took place, and the 1926 and 1929 figures represent more settled conditions on this new basis.

Steel Wages Since the War

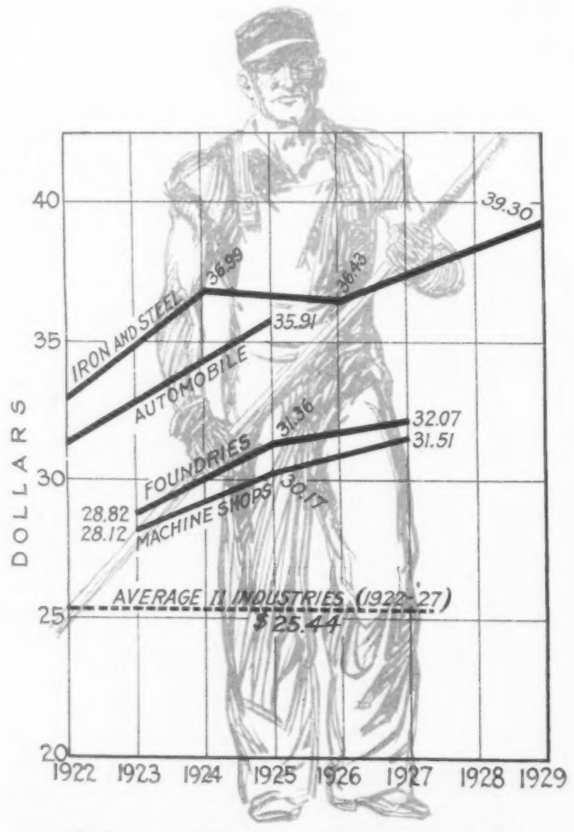
War-time wage rates, including the special overtime rates, were maintained in the steel industry through 1920. Deflation came in 1921. Steel wages and hours since then, as shown by Bureau of Labor figures, have been as shown on page 1009.

These figures disclose some very interesting facts as to both hours and wages.

Changes in Hours

In 1922, while the same primary productive departments which had always operated on two shifts were still on that basis, and the agitation against the so-called 12-hr. day was at its height, these official Government figures show that the average full-time hours of all skilled steel workers were nine a day and the average full-time hours of all steel workers of all classes were less than 10 a day. Moreover, these full-time hours include all the extra time worked in banking furnaces at the end of the week and firing them at the beginning of the week; they include all hours under the "longturn" when shifts were changed, of which so much was then made.

The 12-hr. day in the steel industry is now a thing of the distant past. It is not the present purpose to suggest any conclusions one way or the other in regard to the merits of the controversy in regard to it, but rather to point out the fact that the 12-hr. day affected so small a proportion of all steel workers that its abolition has made a difference in the full working time of the average worker of just an hour a day, i.e., from a full-time average for all workers of less than 10 hr. to one of less than 9 hr. a day.



AVERAGE Full-Time Earnings per Week of the 4 Highest Wage Industries of the 12 Industries on Which United States Bureau of Labor Statistics Has Published Bulletins. Figures from tables by occupations and for male workers only

Increase in Steel Wages

Perhaps the most important fact as to wages shown by the above figures is that the average worker for each class—skilled, semi-skilled, common labor and all workers—is not only working shorter hours but is receiving more in wages under the three-shift than he did under the two-shift system. The increase for all workers averages nearly $7 a week between 1922 and 1929, but the significant fact is that the average productive worker was receiving $4 more per week the year after the change to the three-shift than he received the last year under the two-shift system.

During the same period covered by these four studies of steel wages the Bureau of Labor made similar wage studies for two or more years each for 11 other industries. In all these studies the bureau distinguishes between the actual productive workers

of each industry, who represent the significant facts as to the industry, and various auxiliary and maintenance workers, carpenters, electricians, bricklayers, powerhouse, railroad and other workers, belonging to different trades and whose wages are determined chiefly by those of their particular trade rather than by those of the industry to which they are attached.

With the exception of the slaughtering industry, all the bureau's detailed figures are for the productive workers only. Thus it is possible to make more exact comparisons between the wages of each industry without having those of the lower-wage industries artificially raised and those of the higher-wage industries artificially lowered by including wages of auxiliary workers of different trades.

MR. OLDS is widely known as a student and writer on current social and economic problems. In 1918, he prophecied in "Effect of the War on Business Conditions," that there would be an age of unparalleled prosperity, based chiefly on a new high earning and spending power of the wage-earner class. In 1919-20 he published his "High Cost of Strikes" to show how the strike epidemic of that period was cutting at the very roots of social as well as industrial progress. Steel men doubtless know Mr. Olds best for his "Analysis of the Inter-church Report on the Steel Strike," an analysis which discredited this report as a "flagrant falsification of facts and figures by radical propagandists" of which the church movement was not actually the author but the victim."

On the other hand these various wage studies are not always for the same years. Some industries include large percentages of women workers so that the true wage average is lower than that for male workers only, yet it would be unfair to compare average wages without distinction as to men and women workers. In spite of these differences, however, the accompanying comparisons—for male workers only in industries whose workers are preponderantly male and which are shown by these bureau figures as our four highest wage industries—are most significant.

One of the problems the steel industry faced in changing certain of its basic production departments from a two to a three-shift basis was that of finding adequate labor or of substituting machinery for labor. The success of the industry in this direction seems plain from the bureau figures. These indicate that while the total number of productive workers per given number of plants, representing the whole industry, went up materially in 1924 (three-shift) over 1922 (two-shift); by 1926 the number of workers per plant had gone back below the 1922 level.

For 1929 the United States Bureau of Labor itself makes the following specific comparisons with 1926:

For all blast furnace workers in 32 identical plants.

Nineteen twenty-six—122 employees per stack operated.

Nineteen twenty-nine—103 employees per stack operated.

In other departments identical plants showed number of employees variation between 1926 and 1929 as follows:

Bessemer converters	24	per cent	less employees	in 1929
Open-hearth furnaces	8	per cent	less employees	in 1929
Puddling mills	18	per cent	less employees	in 1929
Blooming mills	9	per cent	less employees	in 1929
Plate mills	11	per cent	less employees	in 1929
Bar mills	17	per cent	less employees	in 1929
Standard rail mills	14	per cent	less employees	in 1929
Tin plate mills	6	per cent	less employees	in 1929
Sheet mills	3	per cent	*more* employees	in 1929

(*Concluded on page* 1048)

Iron and Steel Industry 1922-1929

Average Hours and Wages of Productive Workers

1922	Average Full Time Hours per Week	Average Earnings per Hour*	Average Earnings per Full Time Week
Skilled	54.1	$0.777	$40.69
Semi-skilled	64.2	.444	27.44
Common	66.4	.374	22.66
All workers	59.7	$0.592	$32.98
1924			
Skilled	49.9	$0.959	$46.51
Semi-skilled	55.0	.563	30.45
Common	59.9	.418	25.14
All workers	53.5	$0.722	$36.99
1926			
Skilled	50.1	$0.904	$45.04
Semi-skilled	54.3	.556	30.00
Common	58.8	.426	24.60
All workers	53.0	$0.704	$36.43
1929			
Skilled	50.3	$0.972	$48.15
Semi-skilled	53.9	.607	32.28
Common	60.0	.414	24.83
All workers	52.9	$0.765	$39.30

*In considering the figures for hours per week, earnings per hour and earnings per week together, attention is called to the fact that the weekly figures are averages of hours worked and wages received in the workers' own specified occupation, whereas some of the earnings per hour include pay for work done by various workers in positions other than their own, so at a different wage rate.

Average Earnings per Full-time Week

For Productive Workers as Shown by Tables by Occupations of United States Bureau of Labor Bulletins

	1922	1923	1924	1925	1926	1927	1929
1. Iron and steel	$32.98	.....	$36.99	.....	$36.43	.....	$39.30
2. Automobiles	31.32	.....	.....	$35.91	.....	.....	.....
3. Foundries	.....	$28.82	.....	31.36	.....	$32.07	.....
4. Machine shops	.....	28.12	.....	30.17	.....	31.51	.....
Average Earnings per Hour							
1. Iron and steel	$0.592	.....	$0.722	.....	$0.704	.....	$0.765
2. Coal (bit.)	.753	.....	.696	.....	.664	.....	.....
3. Automobiles	.625	.....	.....	$0.712	.....	.....	.....
4. Boot and shoe	.....	.....	.606	.....	.623	.....	.. ..

Accident Rates in the Iron and Steel Industry 1910-1928—Year and Period

Year and Period	Frequency Rates per 1,000,000 Hr. Exposure: Death	Permanent Disability	Temporary Disability	Total	Severity Rates per 1000 Hr. Exposure: Death	Permanent Disability	Temporary Disability	Total
1910-1914	0.4	1.3	57.5	59.2	2.3	1.1	0.7	4.1
1915-1919	.4	1.0	40.2	41.6	2.2	.8	.6	3.6
1920-1924	.2	.9	32.5	33.6	1.5	.8	.5	2.8
1925-1927	.2	.9	23.4	24.5	1.3	.8	.4	2.5
1928	.2	.8	18.7	19.7	1.1	.8	.4	2.2

Drop in Exports Mainly in Scrap

Heavy Decline From Last Year in Rolled Products—Imports in Two Months One-Fourth Below 1929

WASHINGTON, March 27.—The principal decline in exports of iron and steel products in February, 1930, which dropped 27,664 gross tons to 197,426 tons from 225,090 tons in January, was due to the slump in the outgoing movement of scrap, which amounted to 43,195 tons as against 61,865 tons, a decrease of 18,670 tons.

Rolled lines which showed substantial declines were restricted to four products: Steel bars decreased to 8025 tons from 11,857 tons; galvanized steel sheets to 7058 tons from 10,449 tons; black and galvanized welded iron pipe to 1756 tons from 2801 tons and black and galvanized welded steel pipe to 7507 tons from 9660 tons.

There were some important increases. Wire rods rose to 4373 tons from 3481 tons; hoops, bands and strip steel to 5121 tons from 3323 tons; plain shapes to 15,265 tons from 14,109 tons and steel rails to 6844 tons from 5877 tons.

Compared with February of last year, with exports aggregating 259,693 tons, those in February of the current year showed a decline of 62,267 tons. For the first two months of the current year exports were 422,516 tons, a drop of 110,618 tons under the 533,134 tons exported during the like period of 1929. Rolled steel declined 140,833 tons between the two years; raw and semi-finished products showed an increase.

The gain of 1037 tons in imports in February, with a total of 43,351

Exports of Iron and Steel from the United States

(In Gross Tons)

	February		Two Months Ended February	
	1930	1929	1930	1929
Pig iron	1,897	4,118	4,030	7,887
Ferromanganese	152	42	277	210
Scrap	43,195	21,552	105,060	72,350
Pig iron, ferroalloys and scrap	*45,244*	*25,712*	*109,367*	*80,447*
Ingots, blooms, billets, sheet bars	3,021	775	6,350	2,676
Skelp	5,080	4,249	9,834	7,068
Wire rods	4,373	3,539	7,854	7,950
Semi-finished steel	*12,474*	*8,563*	*24,038*	*17,694*
Steel bars	8,025	17,390	19,882	39,796
Alloy steel bars	469	3,102	1,510	4,887
Iron bars	170	337	401	1,648
Plates, iron and steel	10,827	18,965	20,888	36,350
Sheets, galvanized steel	7,058	17,571	17,507	33,742
Sheets, galv. iron (a)	638		1,343	
Sheets, black steel	11,943	18,747	24,902	32,464
Sheets, black iron	979	1,175	2,196	2,178
Hoops, bands, strip steel	5,121	6,740	8,444	13,631
Tin plate; terne plate	23,497	26,687	48,523	53,074
Structural shapes, plain	15,265	21,533	29,374	38,792
Structural shapes, fabricated	11,146	14,690	22,167	25,432
Tanks, steel	1,329	(b)	2,574	(b)
Steel rails	6,844	16,149	12,721	34,032
Rail fastenings, switches, frogs, etc.	1,237	2,785	2,906	5,411
Boiler tubes	1,784	1,818	3,262	3,342
Casing and oil line pipe	7,175	18,990	14,917	24,415
Pipe, black and galvanized, welded steel (a)	7,507	12,096	17,167	22,440
Pipe, black and galvanized, welded iron (a)	1,756		4,557	
Plain wire	2,083	5,498	4,974	9,343
Barbed wire and woven wire fencing	2,884	5,642	5,298	12,171
Wire cloth and screening	144	201	331	353
Wire rope	568	724	980	1,344
Wire nails	532	1,589	1,049	3,087
Other nails and tacks	561	715	1,195	1,609
Horseshoes	7	26	10	47
Bolts, nuts, rivets and washers, except track	1,245	1,279	2,367	2,690
Rolled and finished steel	*130,794*	*214,449*	*271,445*	*412,278*
Cast iron pipe and fittings	2,973	2,313	5,965	4,511
Car wheels and axles	1,049	1,579	1,957	4,397
Malleable iron screwed fittings	1,259	1,093	2,754	2,293
Iron castings	811	1,270	1,475	2,451
Steel castings	442	1,339	1,048	2,783
Forgings	1,127	1,560	1,875	2,802
Castings and forgings	*7,661*	*9,154*	*15,074*	*19,237*
All other	1,253	1,815	2,592	3,478
Total	197,426	259,693	422,516	533,134

(a) Not separated, prior to 1930.
(b) Not then reported.

Imports of Iron and Steel into the United States

(In Gross Tons)

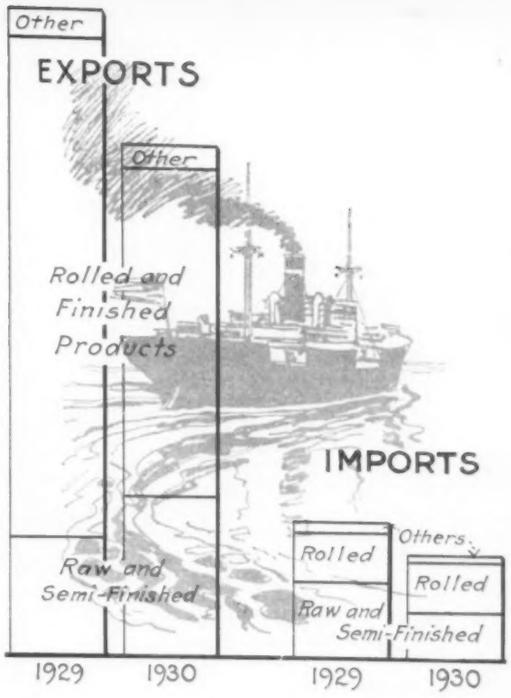
	February		Two Months Ended February	
	1930	1929	1930	1929
Pig iron	8,900	16,299	17,980	32,407
Ferromanganese*	5,135	3,325	9,315	8,827
Ferrosilicon†	335	794	804	1,240
Ferrochrome‡	42	15	87	43
Scrap	1,642	8,524	5,697	15,731
Pig iron, ferroalloys and scrap	*16,054*	*28,957*	*33,883*	*58,248*
Steel ingots, blooms, billets and slabs	1,770	1,841	3,555	3,558
Wire rods	1,115	595	2,059	1,778
Semi-finished steel	*2,885*	*2,436*	*5,614*	*5,336*
Rails and splice bars	98	743	697	814
Structural shapes	12,402	9,017	21,352	18,487
Boiler and other plates	365	982	1,022	1,055
Sheets and saw plates	936	923	2,992	1,750
Steel bars	3,360	2,751	5,659	5,885
Bar iron	111	335	226	574
Hoops, bands and cotton ties	1,731	1,536	2,439	2,718
Tubular products (wrot.)	1,617	4,807	4,881	7,466
Nails, tacks, staples	274	558	869	1,266
Tin plate	13	17	22	58
Bolts, nuts, rivets and washers	49	23	75	41
Round iron and steel wire	275	540	722	1,142
Barbed wire	695	349	1,072	634
Flat wire; strip steel	100	167	309	316
Steel telegraph and telephone wire	1	....	1	....
Wire rope and strand	155	153	452	286
Other wire	21	38	76	79
Rolled and finished steel	*22,203*	*22,939*	*42,866*	*42,571*
Cast iron pipe	2,049	3,648	3,001	6,408
Castings and forgings	160	166	301	376
Total	43,351	58,146	85,665	112,939
Manganese ore*	21,670	20,820	60,292	27,591
Iron ore	203,140	240,934	495,975	390,756
Magnesite	105	246	9,372	2,990

*Manganese content only.
†Silicon content only.
‡Chromium content only.

tons, over those in January, amounting to 42,314 tons, was reflected chiefly in heavier incoming shipments of ferromanganese, which rose to 5135 tons from 4180 tons; steel bars, which increased to 3360 tons from 2299 tons; hoops, bands and scrolls, which rose to 1731 tons from 708 tons; shapes, which increased to 12,402 tons from 8950 tons and cast iron pipe, which rose to 2049 tons from 952 tons.

These gains were partly offset by two relatively important decreases: Imports of scrap declined to 1642 tons from 4055 tons and wrought tubes fell to 1617 tons from 3264 tons. Imports in February were 14,796 tons less than those in February of last year, with a total of 58,146 tons.

For the first two months of 1930, the aggregate of 85,665 tons was 27,274 tons below that in the corresponding period of last year. More than half of this decline was in pig iron and most of the remainder was in scrap.



Two Months of Exports and Imports of Iron and Steel Products

As stated in THE IRON AGE of March 27, page 953, Canada took 77,056 tons of American iron and steel in February and Japan took 40,414 tons. Belgium was the principal source of imports, supplying 9542 tons while Germany furnished 9200 tons and India supplied 7417 tons, all of the latter being pig iron.

Where Certain Products Went Off

Of the steel rails exported in February, Japan took 937 tons; the Philippine Islands, 879 tons; Chile, 816 tons and Cuba 694 tons. Rails exported to Canada amounted to only 262 tons. Of the 10,827 tons of plates exported that month, 8583 tons went to Canada, while that country took 2179 tons of the galvanized sheets, with the Philippine Islands taking 1987 tons.

Canada took 7628 tons of the 11,943 tons of black steel sheets exported, and Japan took 1669 tons. Of the 15,265 tons of plain shapes exported, 12,307 tons went to Canada and 1054 tons to Japan. Japan was the chief foreign consumer of tin plate, taking 7175 tons, while Canada took 2904 tons and British India, 3680 tons. The principal markets taking scrap were Japan, 21,258 tons; Canada, 13,572 tons; Italy, 5778 tons, and Mexico, 1623 tons.

Belgium supplied 6206 tons of the imports of structural shapes; Germany, 3412 tons, and France, 2626 tons. Of the steel bar imports, 1034 tons came from Belgium; 913 tons from Germany; 709 tons from Sweden and 600 tons from France.

The United Kingdom was the source of 2836 tons of ferromanganese, while 2090 tons came from Canada and 207 tons from Italy. Russia supplied 16,594 tons of the 21,670 tons of manganese ore imported; the Gold Coast of Africa, 2875 tons, and Brazil, 1409 tons.

Destination of Iron and Steel Exports from the United States

(In Gross Tons)

Country of Destination	February, 1930	January, 1930	February, 1929	January Through February 1930	January Through February 1929
North and Central America and West Indies	*97,745*	*91,867*	*123,944*	*189,612*	*243,253*
Canada and Newfoundland	77,136	73,411	99,429	150,547	189,882
Cuba	4,554	3,469	5,746	8,023	12,634
Guatemala	362	319	483	681	1,011
Honduras	658	711	1,908	1,369	2,800
Mexico	8,600	9,114	7,703	17,714	14,806
Panama	3,222	1,076	2,994	4,298	5,233
Salvador	75	360	334	435	2,023
British West Indies	1,565	1,251	2,242	2,816	7,498
Other West Indies	1,302	1,808	2,589	3,110	6,189
Other Central America	271	348	516	619	1,177
South America	*17,369*	*36,315*	*47,015*	*53,684*	*92,275*
Argentina	2,672	6,034	13,366	8,706	25,626
Brazil	2,401	4,831	8,027	7,232	13,454
Chile	3,103	9,236	3,768	12,339	9,446
Colombia	1,009	5,672	5,690	6,681	9,377
Peru	1,606	1,710	4,751	3,316	8,587
Uruguay	1,760	1,038	2,252	2,798	3,490
Venezuela	3,968	7,362	8,814	11,330	21,498
Other South America	850	432	347	1,282	797
Europe	*15,347*	*30,632*	*22,780*	*45,979*	*59,125*
France	997	793	4,387	1,790	5,631
Germany	57	2,652	32	2,709	2,955
Italy	7,562	8,487	8,647	16,049	23,446
Poland and Danzig	....	1	1,817	1	11,846
Soviet Russia	1,163	430	927	1,593	997
Spain	23	10,313	639	10,336	982
Sweden	410	551	223	961	683
United Kingdom	3,319	5,394	4,237	8,713	9,772
Other Europe	1,316	2,011	1,871	3,827	2,813
Far East	*65,556*	*64,032*	*64,199*	*129,588*	*134,794*
British Malaya	1,217	1,082	1,646	2,299	2,223
China	4,161	6,929	9,163	11,090	18,073
Netherlands East Indies	4,529	3,119	10,153	7,649	18,275
India and Ceylon	5,057	3,354	4,982	8,411	6,775
Hongkong	293	1,071	781	1,364	1,954
Japan	40,414	39,010	22,293	79,424	59,808
Kwantung	71	393	4,494	464	5,062
Philippine Islands	6,915	5,677	6,357	12,592	15,469
Australia	1,229	1,578	2,476	2,807	4,326
New Zealand	628	522	202	1,150	970
Other Asia and Far East	1,042	1,297	1,652	2,338	1,859
Africa	*1,409*	*2,244*	*1,755*	*3,653*	*3,687*
Union of South Africa	557	123	612	680	746
Egypt	119	1,964	688	2,083	2,434
Mozambique	470	136	128	606	150
Other countries	263	21	327	284	357
Total	197,426	225,090	259,693	422,516	533,134

UNITED STATES IMPORTS OF IRON AND STEEL PRODUCTS

(Gross Tons)

	Feb.	Jan.	Dec.
Austria	13	19	45
Belgium	9,542	9,966	7,458
Czechoslovakia	20	36	31
Denmark	....	150	....
France	5,558	3,266	2,871
Germany	9,200	7,545	9,470
Italy	264	192	96
Netherlands	274	448	2,833
Norway	354	188	1,125
Sweden	1,796	2,513	2,864
Switzerland	23	1	5
United Kingdom	4,247	5,109	7,461
Europe	*31,291*	*29,433*	*35,259*
Canada	4,640	6,827	3,426
Mexico	1	25	....
Cuba	....	47	....
British India	7,417	5,884	8,798
Japan	2	88	2
Hongkong	....	....	1
Total	43,351	42,314	47,486

Cuts Steel at Rate of One Square Inch a Second

FOR the rapid and safe cutting of round bars, tubing, squares, angles and other shapes of alloy steel, nonferrous metals or fibrous material, A. P. De Sanno & Son, 1615 McKean Street, Philadelphia, have brought out the type C Radiac cut-off machine illustrated.

Although Operating at High Speed, the Radiac Wheel Will Not Burn, Discolor or Draw the Temper of the Material

The capacity is for material 2 in. and less in diameter. The machine employs the company's Radiac cut-off wheel, which is 3/32 in. thick and operates at a speed of 16,000 surface feet a minute, cutting material up to 2 in. at the rate of 1 sq. in. per sec. The wheel cuts accurately and does not burn, discolor or draw the temper of the steel or other material.

Ease of adjustment and operation, as well as safety, are features claimed. The base of the machine is cast in one piece. The cut-off wheel is driven by a 7½-hp. 3600-r.p.m. motor through V-belts, as shown. The weight of the motor and its mounting is such as to balance the wheelhead. The motor is controlled by a push button on the front of the machine and other controls are within easy reach of the operator. All moving parts are safeguarded, the cut-off wheel being almost completely covered. Sparks and metal dust are deflected downward and backward into a water pan inside the machine frame. Provision is made for adequate lubrication of all moving parts.

Material to be cut is placed in a V-shaped holder equipped with two adjustable equalizing clamps, one on each side of the cut. The clamps may be adjusted for various diameters from ⅛ to 2 in. by turning a regulating screw, and are operated by an eccentric hand lever, permitting the operator full view of the cut. The fixture in which the work is clamped can be swiveled from 0 to 45 deg. for angular cuts. The weight of the machine is 1200 lb.

Operating Conveniences Feature New Surfacer

CENTRALIZED control is a feature of the single-cylinder surfacer designed recently by the J. A. Fay & Egan Co., Cincinnati, for material up to 24 in. wide.

This machine is equipped with a bed that is adjustable up to 6 in. The table adjustment lever, safety switch, start and stop push-button control, feed change lever, and thickness scale are grouped at one side of the machine, so that all adjustments may be made conveniently from the normal operating position. The table, a one-piece casting, is accurately machined and fitted to the frame, and is raised and lowered through heavy screws equipped with ball thrust bearings. The cylinder of the machine runs in precision ball bearings, two at each end.

The feed comprizes four rolls, the upper in-feed roll being fluted. The drive from the cylinder spindle is through a flat belt and a combination of roller chain and sprockets, which provides a quiet as well as a powerful drive. Pressure is obtained by heavy coil springs which adjust themselves according to the cut being taken. Two rates of feed, 15 and 25 ft. per min., are obtainable through a sliding jaw clutch, and changes may be made while the machine is under feed or running idle.

A feature emphasized is the accessibility of the interior of the machine, the interior being exposed simply by lifting off or out the frame covers, no tools being required.

Floor space occupied by the motor-driven machine is 38 x 60 in. Extra attachments include a flexible upper feed-in roll and sectional chip-breaker. An electric grinder which will grind the full bevel of the knives can also be furnished.

MATERIAL Up to 24-In. Wide May Be Handled on This Surfacer. All controls are grouped at the operating position

Portable Drills with Bohnalite Housings

THE ¼, 5/16 and ⅜-in. portable electric drills, the Nos. 1 and 2 portable screw drivers, valve grinders and tappers made by the United States Electrical Tool Co., Cincinnati, are now equipped with Bohnalite housings. Increased strength is claimed for this construction.

Bohnalite Housings Increase the Strength, and the Redesign Makes Interior More Accessible

The special ¼, 5/16 and ⅜-in. drills have been redesigned to permit removing one side of the handle and housing end in one piece. This construction makes the switch wiring and commutator more accessible for servicing. The brushes are also quickly removable and replaced. The handle has been redesigned to permit a better grip, as well as to improve the appearance of the machine.

Annual report of Continental Steel Corporation reveals a consolidated net profit of $567,669, after all charges, including Federal taxes. This is equal, after preferred dividends to $4.15 a share on 178,262 shares of common stock, compared with $5.12 a share on 171,511 common shares in 1928.

Double Eccentric High-Production Press

Has Ample Room for Long Follow Dies and Operates at 150 to 250 Strokes a Minute—Rigidity a Feature

TO meet the demand for heavier automatic press equipment that will maintain dead true accuracy on progressive die work while operating at 150-250 strokes a minute, the E. W. Bliss Co., Brooklyn, N. Y., has brought out a new 125-ton double-eccentric machine.

This high-speed unit, the No. 675, is designed with ample room for long follow dies. The standard machine has a bolster area of 27 in. front to back by 35 in. right to left, and will handle dies up to 8 in. shut height. Other dimensions are: Area of face of slide 15 x 30 in.; adjustment of slide 1½ in.; standard strokes 1 and 1½ in. and length of feed rolls 15 in. The distance from floor to top of bed is 32 in. and the overall height, without motor, is 108 in. Floor space of 62 x 88 in. is occupied and the weight of the machine, with feeds, is approximately 15,000 lb.

Standard stroke and die space dimensions can be changed to meet unusual conditions.

To maintain rigidity at the high operating speeds, the double eccentric shafts on these machines are supported up to the one-piece ball joint connections. Rigid support is given to the double eccentric shaft and the slide by the long center main bearing and deep ribbed crown, even if the center of pressure of the progressive dies may be considerably off the center-line of the slide.

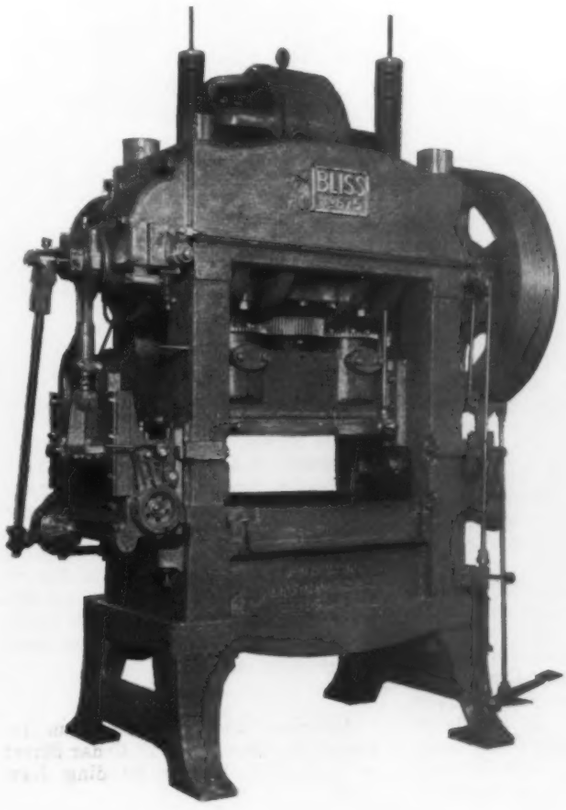
The high-speed double-roller grip feed on this machine is said to be highly accurate. When furnished for feeding strip stock it is equipped with a mechanical starting gage, operated by a treadle, so that the operators' hands are free to guide the strips. With this device the rolls will automatically feed a full stroke into the dies at the beginning of strips, thus eliminating a source of cutting half blanks, burring of stock and punch breakage. This mechanism also permits uninterrupted feeding of strips for practically continuous production.

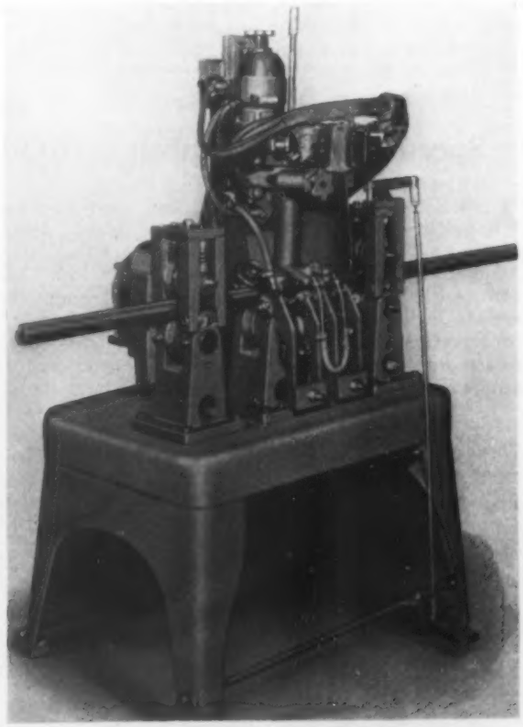
In addition to the high operating speeds, ample room for dies, rigidity that assures maximum die life, and the double roller grip feed mechanism, the machine features a shear-type scrap cutter, rolling key clutch, flexible motor drive and ease of adjustments.

Tube Welder Operates Automatically

AN automatic machine, shown in the accompanying illustration, is designed to weld a longitudinal seam on hollow shafts as they come from the press on which they are formed. The shafts are for brake assemblies, and are fabricated of ⅛-in. plate formed into a tube 1¼ in. in diameter and 36 in. long. As they come from the press there are two edges bent perpendicular to the circumference and adjacent to each other, which must be sealed to complete the shaft. These edges are fused together on this machine as they progress automatically under the arc, at the rate of 36 in. per min.

This machine embodies the features of the "electronic tornado," manufactured by the Lincoln Electric Co., Cleveland, and utilizes the carbon arc welding process. The shafts are fed through the machine under the stationary electrode and progresses automatically as the seams are welded. The carbon electrode forming one end of the arc wastes slowly and is fed down at a speed proper to maintain a steady uniform arc, as the shaft progresses at the proper speed for a perfect weld. Once these speeds have been determined, it is only necessary to place the shaft in position and start the arc. No filler rod, such as is used in automatic welding, is necessary on this type of equipment.





(At left) This 125-Ton Press Is Designed to Maintain Accuracy on Progressive Die Work While Operating at High Speed

(Above) Longitudinal Seams Are Welded at Rate of 36 In. per Min. On the New Lincoln Tube Welder

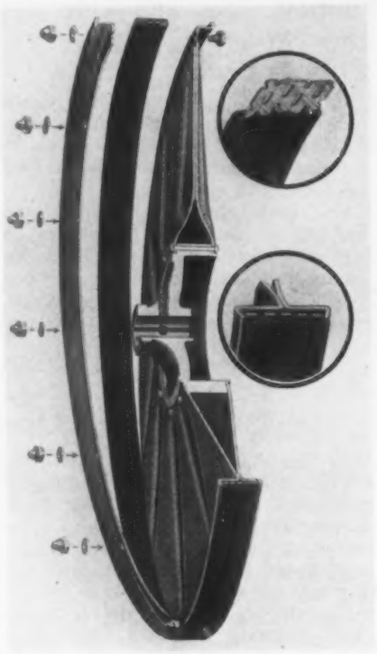
Quick-Change Tire and Disk Wheel for Bandsaws

THE patented quick-change bandsaw tire and steel wheel illustrated are being offered by the Carter Products Co., Grand Rapids, Mich., for use on any type of high or low speed bandsaw.

A flexible, endless steel perforated core or backbone forms the heart of the tire. This core is molded into the tire during curing of the rubber in such a manner that the proper thickness of rubber surrounds the metal on all sides. This is said to assure positive centering of all parts of the tire during rotation, with freedom from saw vibration during high speed operation. The steel core, floating on rubber all around, transmits the saw load around the tire. During molding, the rubber flows through the perforations in the steel backbone shown in the detail view of the tire, and bonds the inner and outer layers of rubber together.

These tires can be applied to any saw by means of the adapter wheel, illustrated. This wheel is of die stamped, double disk, electric welded construction, and embodies a hub to fit the saw involved.

Advantages claimed for "Carter" applications include reduction in saw breakage, in damage to the tire if the saw should break, and in time required to put a saw in operation if a new tire is necessary. With the tire illustrated, an old tire is replaced simply with a spare—like an automobile tire—an operation requiring only a few minutes. It is not necessary to ship the wheel to the manufacturer for scraping the worn tire off the wheels and vulcanizing or cementing a new tire into position.



The Wheel and Quick-Change Tire Is Adapted for Metal and Woodworking Bandsaws

Pump for Machine Tool Coolant and Other Uses

A TWO-STAGE pump, designated as the model A-L, has been added to the line of vertical motor-driven pumps built by the Ruthman Machinery Co., Cincinnati. The machine develops pressure of 39 lb. per sq. in. and pumps to a height of 90 ft. It is equipped with 1½ hp. 1725-r.p.m. motor.

Uses for the pump include supplying coolant to a number of machines from a central reservoir, thereby eliminating the necessity of individual pumps; creating pressure for hydraulic movements; and for air cleaning and humidifying systems.

Like all Ruthman gusher pumps, this machine has no packing, and is of ball bearing construction. The intake is made with a stationary device made up of three curved blades which prevent the water from whirling and forming a conical shape. This construction is intended to prevent entrance of air, making the flow solid and free from air bubbles.

Pressure of 39 Lb. per Sq. In. Is Developed. Liquids can be pumped to height of over 90 ft.

E. F. Moorman Machinery Co., 430 East Woodbridge Street, Detroit, and the A. E. Carle Co., 546 East Woodbridge Street, Detroit, have been consolidated. Both companies have been engaged in liquidating, auctioning and selling of used machinery. The new company, to be known as the E. F. Moorman Machinery Co., is opening a new warehouse and offices, 30,000 sq. ft. of floor space, at 1950 East Atwater Street. E. F. Moorman is president and A. E. Carle is vice-president and general manager.

American Zinc Institute has removed its offices from 27 Cedar Street to room 1562, Lincoln Building, New York.

Speed Lathe for Polish and Other Operations

A SPEED lathe for finishing and polishing of small parts has been placed on the market by the Schauer Machine Co., Cincinnati. Simple design, with minimum of maintenance expense, is a feature emphasized. The construction embodies a two-speed, totally-inclosed, dustproof motor; automatic brake; ball bearings; spindle extension for extra long rod stock; and a 4-in. three-jaw universal chuck.

High or low speed is selected through the control switch in the motor base. Current is cut in by a slight backward push of the hand lever and is cut off and the brake simultaneously applied by a forward movement of the hand lever. It is claimed that the motor can be stopped in 3 seconds when running at high speed. The brake operates against a large diameter extended surface of the motor spindle and the action is smooth but positive. Means are provided for regulating the brake pressure and adjusting any wear of the brake shoe.

The ½-hp. motor provides speeds of 2700 and 1350 r.p.m. on direct current and 3400 and 1700 r.p.m. on alternating current. A hollow spindle within the motor permits insertion of 1-in. rod or tube stock 9 in. long from the face of the chuck. It is possible to polish stock 12 to 16 in. long without end support. The lathe is made for both bench and pedestal mounting.

High or Low Speed Is Obtainable By Means of the Switch in the Base

Looks for Only Moderate Demand for Steel

BY LEWIS H. HANEY

Director, New York University Bureau of Business Research

ACTUAL current requirements for steel, making due allowance for seasonal conditions, hardly changed from January to February. Our so-called composite demand line for the latter month stands at 104.1, as compared with 104 in January, the average for 1921-'27 being 100. Nevertheless, the production of steel ran up sharply in February and the index on the same basis stands at 127. Thus steel production appears to have been definitely in excess of the level indicated by the activity of the chief consuming industries.

If the curtailment of steel production and of production in general had been more prolonged, and if the outlook for general business now were favorable to the early beginning of a steady expansion, this situation would be fairly satisfactory. It would, on the assumptions mentioned, mark a response to firming prices and to increased forward buying, as was the case in 1922.

The assumptions just mentioned, however, do not seem to be valid at the present time. We can certainly tie to the following facts: (1) No shortages of steel or any other basic commodities are to be found, supplies generally being abundant. (2) There are no indications of an early general expansion in business, but only such optimistic arguments as "unemployment and a slump in raw material prices are the best bull arguments," or "low money rates will stimulate business." (3) Finished steel prices are hardly to be described as "firm," and forward buying seems to be small. Merchant furnaces are said to be piling pig iron.

It, therefore, seems fair to conclude that there was some overproduction of steel in February, and the March setback in operating rates is an admission of such conditions.

The February demand line reflects decreases in freight traffic, in general manufacturing (excluding steel and automobiles) and machine tool orders, and in mining.

Automobile production, after eliminating seasonal variation, remained about unchanged. The automobile industry continues very backward and the competitive situation is rather threatening.

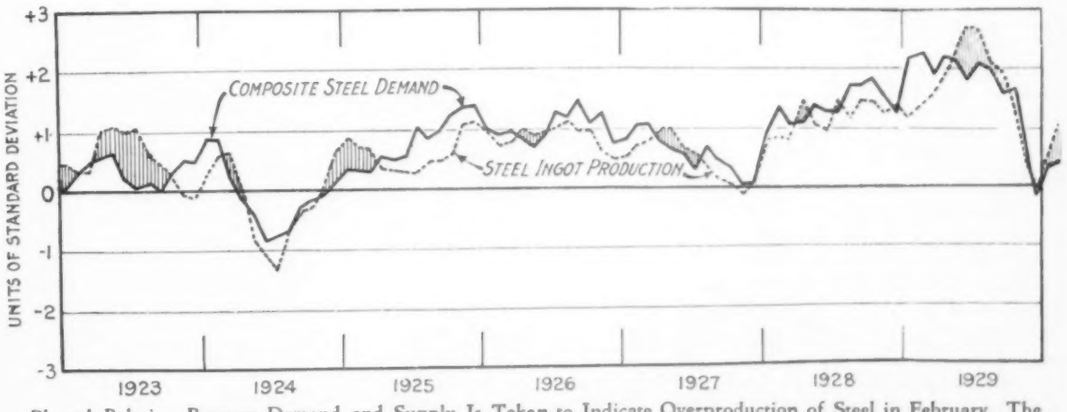
Construction of public works and utilities increased sufficiently to cause a gain in total construction contracts awarded.

As to the near future, we may say that the current low levels of **railroad** car loadings are very unfavorable, the figures being the lowest since 1922, and the net operating income of the carriers has been so reduced that it is no wonder to find equipment buying lagging. We see no good early prospects here.

Building activity continues very low. February building permits were close to the 1921 level, and real estate activity was the smallest in a record that goes back to the beginning of 1924. Even structural steel bookings have recently been running at the lowest levels found in March in the last three years. A turn for the better in building is only a question of time, but no increase of more than seasonal proportions is yet in prospect.

Mining activity has declined on the whole, with copper production curtailed, and coal production in a downward trend. Oil production, too, seems to be undergoing curtailment. Among the best prospects for steel consumption, however, is the trend toward construction of pipe lines for gas and gasoline.

We may conclude that the demand for steel is likely to be moderate for some time and that a period of several months of dullness in general business (probably lasting through July at least) will have their natural effect on the steel industry.



Plotted Relation Between Demand and Supply Is Taken to Indicate Overproduction of Steel in February. The indexes are in terms of their deviations from their 1921-27 averages, each series being adjusted to make the deviations of the two similar in magnitude

This Issue in Brief

Bright annealing by new method cuts pot cost. Charge is covered in a tray suspended from pot cover. Air seal is easily made. As pot carries only its own weight, it can be made light. Thus the quantity of non-payload metal in the furnace is reduced.—Page 1002.

* * *

High wages paid in metal-working industries. Bureau of Labor Statistics shows that average is considerably above the average for all industries. Steel mill worker gets more money under present three-shift system than under former two-shift.—Page 1008.

* * *

Rustless steel castings comprise entire output of new specialized foundry. Molds for heat-resisting castings are made with great care, as metal is costly.—Page 993.

* * *

Eliminates considerable machining of heavy forgings by roughing the forgings under a steam hammer to the approximate shape required. Instead of sending the rough forging to the machine shop it is transferred to drop forging department, where dies do the greater part of the work formerly done in machine shop.—Page 1006.

* * *

Sharp loss in iron and steel export business. Rolled steel tonnage shipped out of the country in first two months of 1930 was 34 per cent below same period of 1929. Slight gain in imports.—Page 1010.

* * *

Production control system relieves foremen and other executives of all paper work. Planning department is housed in a glass inclosure in center of shop. Production planning is done on a control board consisting of a continuous sheet on rollers, on which are listed all machine tools. Time is represented by horizontal lines.—Page 997.

Drop forging dies of carbon steel are worked hard in locomotive plant. One die does all the work from plain bar to finished forging, even when medium carbon steels are forged.—Page 1006.

* * *

Machine tool sales survey reveals that about 30 per cent of sales is to automotive industry. Exports are next with about 12 per cent, and agricultural implement shops third, with 8.67 per cent.—Page 990.

* * *

Rustless steel pipe, cast centrifugally, is superior to sand-cast. Structure resembles a forging, and pipe is said to be free from blow holes and porosity.—Page 994.

* * *

Annealing pot repair cut 75 per cent. Grünewald pot can be used until it becomes so thin as to be no longer air-tight. Even then it is necessary to replace only that part of casing exposed to heat of the furnace.—Page 1003.

* * *

Carbon steel die blocks more economical for small production. Baldwin finds that expensive alloy steel dies are not justified on drop forged parts where average order is only about 200 pieces.—Page 1005.

* * *

Makes drop forgings without draft. To produce iron boiler jaws with parallel faces, without necessity of machining, parallel-sided punch cuts out the inside flash and trims off taper, due to draft. Draft on outer side of clevis is flattened by slipping the jaw over a bent tongue in center of press bed, and giving one squeeze.—Page 1007.

* * *

No indication of an early general expansion in business, says Dr. Haney. Forecasts a period of several months of dullness in general business, probably lasting through July at least.—Page 1015.

Will it pay to run the shop overtime? A glance at the control board in use in an eastern Pennsylvania plant gives the answer. The board makes it possible to feed each machine with the class of work it can handle most economically. In addition, it reveals the daily progress of work.—Page 998.

* * *

Pits under planers provide convenient access for removal of gear assembles, for renewal or repair. Pits extend the entire length of the machines and are some 10½ ft. deep.—Page 1000.

* * *

Pressed steel, welded, replaces cast iron for lining of Detroit-Windsor tunnel. Weight is only one-third. Cost of manufacture, freight and erection is two-thirds that of cast iron.—Page 985.

* * *

Was steel overproduced in February? Dr. Haney thinks so. ". . . appears to have been definitely in excess of the level indicated by activity of the chief consuming industries."—Page 1015.

* * *

High accuracy in steel fabricated by welding. Eleven tunnel segments, each weighing half a ton, check within 3/32 in. of theoretical circumference, when assembled in a 32-ft. circle.—Page 985.

* * *

Annealing is speeded up by using pots of corrosion-resisting alloy. For their surfaces are always free from oxide, allowing the charge to be heated up and cooled down in minimum time.—Page 1003.

* * *

Production planning department works backward from delivery promise date. A schedule is prepared showing dates assigned for production of each part, and dates that raw material and purchased finished parts must be on hand.—Page 997.

Mechanical Engineers to Celebrate

Events of Next Few Days Give Interest to What The Iron Age Said Fifty Years Ago

THE fact that the American Society of Mechanical Engineers will celebrate in the next few days the fiftieth anniversary of the founding of the society has been announced in these columns. The events will begin in New York on April 5 and end with a series of meetings in Washington on April 7 and 8.

Iron Age Editor First Secretary

Fifty years ago THE IRON AGE in its issue of April 8, 1880, told of the organization meeting held the day before in the gymnasium of Stevens Institute of Technology at Hoboken, N. J. At this meeting James C. Bayles, then editor of THE IRON AGE, was secretary, and in the absence of A. L. Holley, who was detained at home by sickness, Henry R. Worthington was called to the chair.

The account of the meeting said: "About 80 gentlemen handed in their names. The specific object of the meeting was to complete the organization of the society, by considering, amending and adopting the rules for the government of the society, prepared by the committee on organization. These rules were read by Mr. Worthington, as chairman of that committee, and caused much discussion, but were finally adopted without important amendment. These rules divide those admitted to the association into four classes—members, honorary members, associates and juniors."

Professor Thurston First President

After the election of officers, which then followed, the meeting adjourned subject to the call of the council, and the members were given a luncheon by President Henry Morton of Stevens Institute. Prof. Robert H. Thurston, who was then professor of mechanical engineering at Stevens Institute, and later director of Sibley College, Cornell University, was elected president.

In concluding the account of the meeting, THE IRON AGE ventured to say: "The American Society of Mechanical Engineers is now successfully launched, and promises to have a long and useful life. The success of the undertaking is due very largely, and perhaps wholly, to Prof. John E. Sweet of Syracuse, with whom the idea originated, and who has taken much trouble in recruiting the membership and creating among the profession an interest in the preliminary meetings for organization. As he has modestly refrained from accepting nomination for office, it would be a graceful courtesy on the part of the council to invite him to read the first paper at the next meeting."

The report of the first annual meeting (Nov. 4, 1880) appeared in THE IRON AGE of Nov. 11, 1880, and it appears that Professor Sweet was the author of the first paper. He devoted himself to "friction as a factor in motive power expenses" and described a new form of engine, possessing many features of novelty and advantage, the straight-line engine, which in subsequent years became synonymous with Professor Sweet's engineering achievements.

The second paper of the meeting, it may be mentioned in passing, was a lengthy dissertation followed by an active discussion against a plan to make the metric system compulsory and was delivered by Coleman Sellers, Philadelphia.

This first annual meeting was to have been held in the rooms of the American Society of Civil Engineers, 104 East Twentieth Street, New York, according to an announcement in THE IRON AGE of Sept. 20, 1880, but the meeting was held actually at the theater of the Union League Club, Twenty-sixth Street, New York.

Foreign Engineers to Speak

Presentation of papers by distinguished engineers from 16 foreign countries will be an outstanding feature of the fiftieth anniversary celebration. Each paper will summarize the influence of engineering upon social, cultural, economic and political life. The authors will be awarded a fiftieth anniversary medal. The countries and engineers who will represent them at present stands as follows:

Austria — Hofrat Ing. L. Erhard, director Technisches Museum, Vienna.

Belgium.—Staff of six eminent engineers represented by M. le Baron Gaston de Bethune.

Canada.—Brig. Gen. C. H. Mitchell, dean of faculty of applied science, University of Toronto, Toronto.

Czechoslovakia. — Dr. Stan. Spacek, ministry of Public Works, Prague.

France.—Georges Claude, general manager, Liquid Air Co., Paris.

Germany.—Dr. Ing. Conrad Matschoss, director, Verein deutscher Ingenieure, Berlin.

Great Britain. — Loughnan St. L. Pendred, editor, *Engineer*, London.

Italy.—Senator Luigi Luiggi, Rome.

Japan.—Dr. Masarvo Kamo, college of engineering, Tokio Imperial University, Tokio.

Netherlands.—Prof. Ir. D. Dresden, president, Jaffa Engine Works, Utrecht.

Scandinavia.—Vilhelm Nordstrom, vice manager, AB. de Lavals of Angturbin, Stockholm.

South America.—Prof. Donato Gaminara, Montevideo, Uruguay, member of the Pan-America Highway Commission and member of faculty of the University of Montevideo; and Prof. Julio Garson Nieto, chief engineer, office of Longitudes, Ministry of Foreign Affairs of Colombia.

Switzerland.—Prof. Dr. Aurel Stodola, professor of heat engineering, Federal Technical High School, Zurich.

United States.—Dr. C. E. Grunsky, consulting engineer, San Francisco, and president of the American Engineering Council.

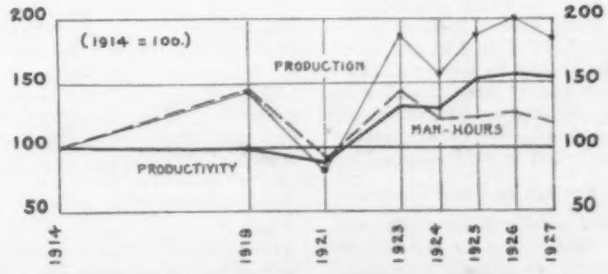
Productivity Still Advancing

More Output Per Man-Hour in Steel Industry Though Rate of Increase Is Slowing

MAN-HOUR productivity increased 1 per cent in the iron and steel industry between 1925 and 1927 and 55 per cent between 1914 and 1927, according to a study made by the Bureau of Labor Statistics, Department of Labor, which covers 11 manufacturing industries. The result of the study is published in the March number of *Monthly Labor Review*.

Employment and production figures from the Census of Manufactures for 1927 permitted the extension of the bureau's index numbers of man-hour productivity to include 1926 and 1927. The largest increase in man-productivity between 1925 and 1927 was 12 per cent, made by the cement industry. The cane sugar refining industry was the only one of the 11 showing no change, while the automobile industry showed a decrease less than 1 per cent.

In both the automobile and cane



Each Man-Hour Now Produces 55 Per Cent More Output Than a Decade Ago, in the Steel Industry

sugar refining industries the decreases from 1926 to 1927 were caused by decided declines in the total production, but with relatively smaller reductions in the average number of man-hours involved. The largest increase in man-hour productivity between 1914 and 1927 was in the rubber tire industry, amounting to 292 per cent.

Among the four industries with index numbers reaching back to 1899, the iron and steel industry shows an advance in man-hour productivity of labor from that year to 1927 of 163 per cent. In the three industries where the indexes for man-hour productivity of labor begin with 1904, it is found that the automobile industry made the great increase of 595 per cent between 1904 and 1927.

MAN-HOUR PRODUCTIVITY OF LABOR IN IRON AND STEEL INDUSTRY
(1914=100)

	Steel Industry as a Whole	Blast Furnaces	Steel Works and Rolling Mills
1899	59	44	63
1904	69	59	70
1909	100	80	104
1914	100	100	100
1919	95	85	96
1921	87	106	85
1923	131	149	126
1924	130	156	123
1925	153	196	143
1926	157	204	149
1927	155	203	146

Quad-City Foundrymen Hold Regional Meeting

The first regional meeting of the American Foundrymen's Association, sponsored jointly with the Quad-City Foundrymen's Association, was held March 26 at Moline, Ill. Numerous plant visitations, round-table discussions at the luncheon hour and an afternoon technical session completed a full day for the 310 who registered. It is significant that 153 firms were represented. About 435 were seated at the dinner, a feature of which was an address on "The Foundry, an Industry in Modern Society," by S. W. Utley, president, Detroit Steel Casting Co., Detroit, and past president of the American Fundrymen's Association.

Upper Limits of High-Test Iron

Active discussion took place at the round-table meeting on high-test iron. Other similar meetings, of which there were six, were well attended. A thought expressed on high-test iron was that the most commonly desired tensile strength range is between 40,000 and 50,000 lb. per sq. in. As high as 110,000 lb. tensile strength can be obtained by special and often expensive methods. Therefore, at least at present, the upper extreme in high-test iron is seldom sought.

Prime Factors in Sand Control

Daily and weekly tests of the condition of sand piles, control and accurate use of mechanical equipment, and the intelligent purchase of materials were stressed by R. F. Harrington, metallurgist, Hunt-Spiller Mfg. Co., Boston, as prime factors in effective sand control and conservation in the gray iron foundry. Co-operation must exist between those who prepare and those who use the sand, and the user and the producer must have a common understanding. Close control of air pressure and the installation of counters on jolt machines were recommended, as well as the placing of sand control under a technical head.

At the Hunt-Spiller foundry less than one-third of the defective castings are now traceable to adverse sand conditions. The cost of new materials now used is about one-fourth of what it was before intensive practice of sand control and conservation was undertaken. A word of caution was expressed to the effect that sand often is blamed when gates and patterns are at fault. Finally, swell and strains and overweight in castings can be overcome by sand control.

Joint May Meeting for Four Steel Treaters' Chapters

Four chapters of the American Society for Steel Treating are to unite in a joint meeting, May 23. The Philadelphia and Lehigh Valley chapters are to be the guests of the New York and New Jersey chapters and a tentative program by the committee on arrangements is announced.

A trip through the plant of the Western Electric Co., Kearny, N. J., is scheduled for the morning, followed by a luncheon at the Newark Elks Club, 1048 Broad Street, Newark, the members and guests being entertained by an anonymous donor. In the afternoon a personally conducted trip will be taken through the Wright Aeronautical plant at Paterson, N. J. At 6.30 in the evening a subscription dinner will be held at the Newark Elks Club at $2 per plate.

Preliminary to the principal speaker of the evening, F. F. Lucas, Bell Telephone Laboratories, New York, will speak upon the subject, "My Impressions of Japan." Mr. Lucas was one of the speakers at the World Engineering Congress in Tokio last fall and is a past-chairman of the New York chapter and internationally known for his work in high-power photomicrography.

The principal address will be given by Horace C. Knerr, president, Metallurgical Laboratories, Inc., Philadelphia, on "Aircraft Metallurgy." The toastmaster will be Dr. George B. Waterhouse, professor of metallurgy, Massachusetts Institute of Technology, Cambridge, Mass. The national officers of the society have been invited to be present.

Globe Steel Tubes Co., Milwaukee, has moved its Eastern sales office to the new Lincoln Building, 60 East Forty-second Street, New York. R. R. Lally is manager.

Three New Chapters of Gray Iron Institute

Considerable progress in the formation of local chapters of the Gray Iron Institute has been made by that institute in various districts. Organizations of local chapters have been effected in the Chicago and Buffalo districts. A. W. Lemme, Elizabeth Street Foundry Co., is president of the Chicago district organization and C. B. Magrath, North Western Foundry Co., is secretary. At the head of the Buffalo district organization is J. H. Pohlmann, J. W. Pohlmann Foundry Co. with A. U. Ogden, Steel Drum Accessories Co., secretary. A group has been formed in the Worcester-Boston district to conduct studies of the cost system of the institute.

Steel Leaders to Confer with Scrap Industry

The American Iron and Steel Institute has appointed a committee consisting of James A. Farrell, president, United States Steel Corporation; Eugene G. Grace, president, Bethlehem Steel Corporation, and L. E. Block, chairman, Inland Steel Co., to confer with a committee representing the Institute of Scrap Iron and Steel. This committee was appointed as the result of a petition filed with the board of directors of the American Iron and Steel Institute by the scrap institute.

The committee representing the scrap industry, which probably will be headed by Benjamin Schwartz, director general of the scrap institute, has not yet been named.

Direct dealing between producers and consumers of scrap and other matters concerning the scrap supply will be discussed. No date has been set for the conference.

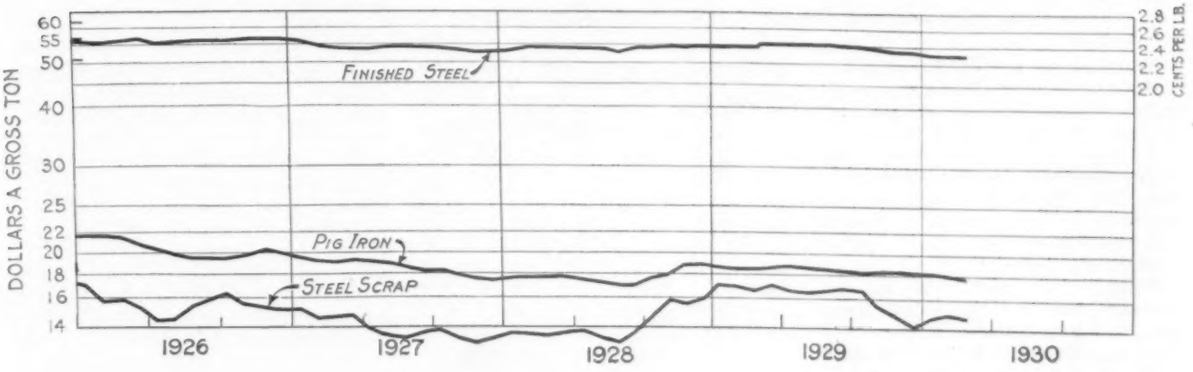
Diesel Engine Meeting at State College

More than 15 papers will be presented at the third national meeting of the oil and gas power division of the American Society of Mechanical Engineers, to be held at the Pennsylvania State College, State College, Pa., June 12 to 14.

Five technical sessions have been arranged. Thursday evening will be left open for a card party and dance, while Friday afternoon and evening will be devoted to excursions and golf, and the usual banquet, respectively. Arrangement has been made for the use of the new dormitory as the main living quarters for those attending the meeting. It is expected to hold an exposition of Diesel engine accessories in the Armory on the campus grounds, as in the case of the two previous meetings.

Ohio Electric & Controller Co., Cleveland, has changed its name to the Ohio Electric Mfg. Co.

Scrap Has Rebounded from December and Then Gone Lower in Recent Weeks, but Still There Is a $3 Differential with Pig Iron



Scrap Prices Lowest Since 1928

Quarter's Average $2 Below First Quarter of 1929, but $1 Above First Quarter of 1928

PRICES of heavy melting steel scrap at Chicago, Philadelphia and Pittsburgh showed a rebound in February, but then declined again. The average of these prices for the first quarter was the lowest for any quarter since the third quarter of 1928. It is only fractionally lower, however, than that of the last quarter of 1929. At $14.82, the average of the first three months of this year, compares with $16.90, or more than $2 higher, in the first quarter of last year. It is, however, more than $1 above the $13.69 average for the first quarter of 1928.

At $14.58, the closing week's average for March, the figure is at the quarter's low, which was touched also at the end of January. Except for the $14.15 average in December, this is the lowest figure since early September, 1928.

Meantime, pig iron during the quarter averaged $17.99 a gross ton, which also is the lowest figure since the third quarter of 1928. It compares with $18.31 in the last quarter of 1929 and with $18.39 in the first quarter of 1929.

Finished steel also reached a low figure in the first quarter. At 2.315c. a lb., the finished steel average is the lowest for any quarter since the middle of 1922, when the industry was just recovering from the great slump of the preceding year. It compares with 2.365c. in the last quarter of last year, and 2.391c. in the first quarter of last year.

	Steel Scrap (Gross Ton)	Pig Iron Ton)	Finished Steel, C. a Lb.
1925 *average*....	*$17.12*	*$20.58*	*2.465*
1926 *average*....	*15.48*	*20.42*	*2.439*
1927 *average*....	*14.00*	*18.55*	*2.357*
1928 *average*....	*14.29*	*17.67*	*2.352*
January, 1929.....	17.02	18.43	2.391
February	16.96	18.38	2.391
March	16.71	18.36	2.391
April	17.18	18.52	2.412
May	16.54	18.70	2.412
June	16.39	18.65	2.412
July	16.60	18.48	2.412
August	16.86	18.38	2.402
September	16.60	18.27	2.394
October	15.58	18.33	2.371
November	14.83	18.36	2.362
December	14.15	18.24	2.362
Year's average..	*16.28*	*18.43*	*2.393*
January, 1930.....	14.65	18.19	2.325
February	14.92	18.02	2.307
March	14.88	17.75	2.312
3-month average.	*14.82*	*17.99*	*2.315*

Gray Iron Castings Orders Rose in February

Business placed with gray iron foundries increased in February, but February production fell below that of the previous month, according to the monthly report of the Gray Iron Institute, Cleveland. Reports from 130 foundries showed that their February production of castings was 85.5 per cent of normal production, which is figured as the average monthly tonnage of castings for the past three years. January stood at 85.5 per cent and February a year ago at 111.8 per cent. New business received in February by 67 foundries averaged 98.2 per cent of normal, compared with 89.4 per cent in the preceding month and with 118.3 per cent in February last year. Unfilled orders Feb. 28, as shown by reports of 66 foundries, were 70 per cent, compared with 51 per cent on Jan. 31 and 112.5 per cent at the end of February, last year.

Of 114 foundries giving views on the business outlook, 21 reported the outlook as good, 71 fair, 21 poor and one bad.

The greatest activity in February was shown in the district that includes Wisconsin, Illinois and all territory west of the Mississippi River. In that territory 53 foundries operated during February at 95.4 per cent of normal production. Eastern foundries came next, 31 in New England, New York and New Jersey and Canada reporting a production of 80.5 per cent of normal in February. In the third district, including Pennsylvania, Michigan, Ohio and Indiana and the territory southeast of the Mississippi River, 46 foundries operated at 79 per cent of normal. Forty-seven foundries, with a normal production of 100 to 250 tons a month, operated at 93.7 per cent in February, making a better showing than smaller and larger plants. The poorest showing was made by large foundries with a monthly capacity of over 400 tons. These numbered 16 and operated at 78.4 per cent of normal.

Foundries in Ohio, including makers of gray iron and also other castings, operated better in February than in January, according to the monthly report of the Ohio Foundries Association. Ohio foundries reporting operated at 90.2 per cent in February, compared with 82.4 per cent in the preceding month and with 103.3 per cent in February last year.

More Steel Moves by River

River commerce in steel products on the Ohio River in the Pittsburgh district amounted to 74,385 net tons in February, according to the monthly report of the United States Engineer's Office, Pittsburgh. This compares with 64,736 tons in the previous month and with 72,203 tons in February, 1929. On the Monongahela River 80,327 tons of steel was moved in February, as against 58,784 in the preceding month and 83,358 in the corresponding month last year. Allegheny River steel shipments totaled 210 tons in February and 100 tons in January. Last February there was no movement.

Approximately 1200 persons heard George A. Richardson give a lecture, illustrated by motion pictures, on the manufacture of structural steel shapes at plants of the Bethlehem Steel Co. The lecture was delivered March 20, at the Mayflower Hotel, Washington.

The machine for piling sheets that was illustrated on page 799 of THE IRON AGE of March 13 was developed by the American Sheet & Tin Plate Co. and is made and sold under license by the Wean Engineering Co., Inc., Warren, Ohio.

Public Building Contracts to Be Let Soon

Awards Expected This Month to Further Government Program—Road Work Important, Also

WASHINGTON, April 1.—Contracts will be let in April under the Keyes-Elliot $230,000,000 public buildings act, and officials feel that the awards will be an important factor in stimulating construction. Secretary of the Treasury Mellon has expressed the view that the present time is the most opportune and economical for the Government to build.

President Hoover in his message to Congress last December urged general provision for public buildings, and the construction of a series of dignified buildings for Federal departments whose completion will be expedited. Progress in constructing those Government buildings now under way is greater than had been originally expected.

With the passage of the Keyes-Elliot bill, total authorizations for public buildings, outside of Washington, are $363,000,000. It carries $100,000,000 for construction in Washington. Postoffices to be built with these funds will cost $115,000,000. The Treasury has planned to proceed immediately with the construction of new quarters for the Public Health Service and the Interstate Commerce Commission and to undertake the remodeling of the antiquated State, War and Navy Building.

Another important measure recently passed is the Dowell $125,000,000 public roads act, which is expected to help the unemployment situation. The recently enacted first deficiency bill carries $169,447,000 and was made immediately available. It includes appropriations for a number of projects.

Cleveland Steel Companies Interlock

Board of Directors of Otis Steel Co. Shows Close Relation With Cleveland-Cliffs and Corrigan, McKinney

ANOTHER interesting move in the realinement of interests controlling some of the Cleveland steel industries is the election of Elton Hoyt II, Pickands, Mather & Co., to the board of directors of the Otis Steel Co. With Mr. Hoyt's election, both the Mather companies, Pickands, Mather & Co., and the Cleveland-Cliffs Iron Co., have representatives on the Otis board, representatives of the Cleveland-Cliffs company for some time having had a large interest in the Otis company.

At the election of the Otis company at the annual meeting March 28, William G. Mather, president of the Cleveland-Cliffs company, gave up the chairmanship, the position being left vacant. President E. J. Kulas and other Otis officers were re-elected. Three directors retired. They were Charles F. Batchelder, representing the Chase National Bank, and Edward F. Hayes, Bancamerica-Blair Corporation, both New York banking firms, and C. A. Otis, senior partner of Otis & Co., Cleveland. Directors re-elected were William G. Mather, S. Livingston Mather, H. A. Raymond and D. T. Croxton of the Cleveland-Cliffs Iron Co.; E. J. Kulas, George Bartol, John Sherwin, Otto Miller, F. H. Ginn, R. H. Clarke and John Sherwin, Jr.

Elton Hoyt as a director of the Otis company, it is understood, will represent the Van Sweringen interests that are credited with owning control of the Otis company. The Van Sweringens, with their allied Sherwin and Bradley interests also holding Otis stock, are interested in the Midland Bank of Cleveland, of which Elton Hoyt was one of the founders.

A consolidation of the Otis Steel Co. and the Corrigan, McKinney Steel Co. is looked for in view of the fact that by the purchase of control of the latter by the Cleveland-Cliffs Iron Co. an affiliation of interests in the two steel companies has been brought about, prominent leaders in the Cleveland iron and steel industry having interests in both companies. The election of Mr. Hoyt to the Otis board apparently brings about a still closer bond of affiliation of Cleveland leaders in local iron and steel plants.

Progress in Study of Steels at High Temperatures

A study of the high-temperature mechanical properties of cast and wrought carbon steels of customary composition was decided upon by the joint research committee of the American Society of Mechanical Engineers and the American Society for Testing Materials on the effect of temperature on the properties of metals, at its meeting in Detroit, March 18, during the week of committee meetings of the testing society.

These comparisons are planned to include ordinary high temperature tension tests and long-life, or so-called, creep tests. A decision was also reached to study the high temperature properties of one of the high nickel-chromium (austenitic) steels, particularly as regards the effects of preliminary treatment, carbon content and microstructure. The inclusion of a number of alloy steels in the program of future tests was discussed, but no definite selections were made.

Attention was given to many of the details involved in the fatigue test program relative to carbon steel at different temperatures, which is under way at the University of Illinois, Urbana, Ill., under the joint supervision of the committee and Prof. H. F. Moore. Consideration was also given to past work of the committee with the object of enabling the preparation of several reports which will quite probably be included in the annual report of the joint commitee for presentation at the annual meeting of the society in June.

Shipping Board Sells Eleven Ships for Scrapping

WASHINGTON, April 1.—The Shipping Board last week announced the sale of 11 steel cargo vessels of 95,620 deadweight tonnage to the Union Shipbuilding Co., Baltimore. The ships are to be scrapped. Seven are at New York, two at Norfolk, Va., and one at Philadelphia. Another ship, located at New Orleans, was sold to T. Smith & Co., Inc., New Orleans. The board also authorized the advertisement for sale of the six remaining laid-up vessels at New Orleans and Mobile for scrapping or conversion to barges and the 15 remaining vessels of the Caldwell, N. Y., fleet not considered salable as steamers will be offered on the same basis. Bids on the Gulf group will be received April 28 and those for the Hudson River group will be received June 2.

Name Engineering Advisers for Industrial Museum

Appointment of three engineering advisers to aid in the work of organizing the Industrial Museum founded in Chicago by Julius Rosenwald has been announced by the American Engineering Council.

These advisers are: M. E. Cooley, dean emeritus of the colleges of engineering and architecture, University of Michigan; E. L. Ryerson, Jr., vice-president, Joseph T. Ryerson & Son, Inc., Chicago; Joseph W. Roe, professor of industrial engineering, New York University, New York.

Manning, Maxwell & Moore, Inc., 100 East Forty-second Street, New York, has appointed the Smith Booth Usher Co., 228 Central Avenue, Los Angeles, as representative for southern California in the sale of tools manufactured by the Putnam Machine Works, Fitchburg, Mass. The line consists of heavy machine tools for railroad shops and general manufacturing, including heavy production tools for automobile manufacturers and machinery for steel and sheet mills.

Foundries Must Give Engineering Service

Steel Founders Urged to Give Greater Support to United Efforts to Meet New Competition

AT a meeting at the Statler Hotel, St. Louis, March 27, at which Burtner Fleeger, Oklahoma Steel Castings Co., Tulsa, Okla., presided, the Steel Founders' Society discussed ways and means for better serving the industries of America. It was brought out that the production of steel castings involves more than the supplying of a commodity—it is distinctly an engineering service.

Stressing this phase, F. J. Stanley, Michigan Steel Casting Co., Detroit, and others, advocated even greater cooperation with designers and engineers of the companies to whom the steel foundries sell—lending assistance and giving such suggestions as will enable the customer to secure the maximum advantage and service from the steel castings he buys.

Reports from those presented indicated that bookings, production and shipments are holding firm as the first quarter draws to a close. A slight upward trend is apparent in some districts. Most foundries are optimistic regarding business during the second quarter.

Rapid Changes Intensify Competition

Granville P. Rogers, managing director of the society, outlined some of the sweeping changes that have turned things upside down in the steel industry.

"New methods and processes are revolutionizing operations that have been considered standard ever since the commercial production of steel started," he said.

"A whole new family of alloys, which have followed the stainless steel patent of Harry Brearley in England in 1916, have made their appearance during the past few years. Every year, almost every month sees the advent of some new and important combination of metals —and the end is not yet.

"When we learn that ore is being reduced by a magnetic process, that sponge iron has been developed, that puddlers of wrought iron are losing out to machines, and that metal surfaces are being hardened ten times as quickly by immersing them in hot gas, we realize the magnitude of the changes that are taking place.

"Ingots can now be cast in centrifugal molds. Continuous sheet mills are in full operation. Combined drawing and rolling action features the production of sheet steel by a new process.

"High-speed electrical welding of tubes is now a reality, with at least four different processes in use. Low-temperature ore reduction is on the near horizon."

Integration Is Necessary

Increasing competition within industries and competition of industry against industry are forcing integration either through mergers or trade associations, Mr. Rogers pointed out.

"The steel casting industry can profit by examples of unified effort," he declared. "It would serve no useful purpose to merge a hundred scattered foundries serving local areas into one corporation with remote control. . . . But you have a trade organization—the Steel Founders' Society of America—the only national organization that serves directly the steel foundry interests, and which can be made a clearing house for all that is progressive in your field. It can, to a large extent, take the place of an actual merger of interests and, properly supported, furnish its members with constructive developments in foundry practice, in new uses for castings, in protection from encroachment of forgings, weldings, stampings. . . . It can foster better trade practice, closer cooperation among executives with its valuable exchange of ideas, and assist in getting more business for its members, under better conditions, and at a profit."

Clark McKercher, New York attorney and counsel for the society, delivered an address on the "Modern Trade Association."

At a joint meeting of both large and small castings manufacturers, Hibbard S. Greene, merchandising executive for the Chain-Belt Co., Milwaukee, set forth what he considered good merchandising was *not*. Going on to the positive side of the question, Mr. Greene gave a number of successful sales recipes and sound merchandising practices.

The next meeting of the society will be held at Hotel Hollenden, Cleveland, May 13 and 14, in conjunction with the convention of the American Foundrymen's Association.

Pittsburgh Opposes Freight Rate Rise

Principal Objection Centered on Short Haul Charges—Metropolitan Similar to Chicago's Proposed

REPRESENTATIVES of some 60 steel producing and consuming companies in the Pittsburgh district, meeting under the leadership of the Pittsburgh Chamber of Commerce, have instituted a concerted drive against the Interstate Commerce Commission's proposed increase in freight rates on iron and steel products in Official Classification territory, which is to become effective May 20. Evidence has been submitted showing that Pittsburgh district shippers would face an added freight bill of more than $1,000,000 annually, should the new rate scale be applied.

Principal objection is centered on the proposed increases in short haul rates, which would affect inter-company and inter-plant shipments in the district. These disadvantages would best be remedied by the formation of a metropolitan Pittsburgh district freight rate zone similar to that in effect in the Chicago district. The present switching zone is confined to the city limits, with the exception of two points, and does not embrace many of the large manufacturing plants in the vicinity.

Another disadvantage to Pittsburgh shippers is the fact that the district is split by an imaginary line dividing Trunk Line and Central Freight Association territory, thereby creating two different classes of rates from the same district. It is contended in the complaint of the Columbia Steel & Shafting Co., Carnegie, Pa., that this condition could be corrected by the establishment of a switching district taking in as much territory as possible, and by sweeping aside the imaginary line and placing all of the western part of Pennsylvania in Trunk Line territory.

A protest will be filed with the State Service Commission, as the rate schedule affects intra-state movement, and a similar protest to the Interstate Commerce Commission is being considered.

Pig Iron Rates Held to Be Not Unreasonable

WASHINGTON, April 1.—The rates of $3.91 a gross ton on pig iron from the Buffalo, N. Y., district to Williamsport, Pa., and of $4.91 from Buffalo to Harrisburg, Columbia, Littlestown, York, and Wrightsville, Pa., are not unreasonable, according to a proposed report by Examiner Carl A. Schlager, who recommended that the complaint brought against the rates by the Harrisburg Foundry & Machine Co. and other melters be dismissed.

North American Car Corporation reports the largest February business in the history of the company. The average number of cars in operation during the month was 8860, compared with 5160 in February, 1929. The total for February of this year includes approximately 600 foreign cars, in addition to those owned by the company.

Record Production of Pig Iron and Ferroalloys in 1929

TOTAL production of pig iron and ferroalloys in the United States in 1929 *is reported by the American Iron and Steel Institute at* 42,613,983 *gross tons, exceeding by* 2,252,837 *tons, or* 5.6 *per cent, the highest year's total made previously* (40,361,146 *tons, in* 1923). *Of the aggregate,* 41,757,215 *tons was pig iron and* 856,768 *tons was ferroalloys, each registering a new high record. Pig iron showed a gain of* 11.6 *per cent, and ferroalloys one of* 13.6 *per cent, over the* 1928 *output.*

PRODUCTION OF PIG IRON AND FERRO-ALLOYS BY STATES, 1925–1929.

States.	1925	1926.	1927.	1928.	1929.
Massachusetts		2,729,261	2,775,351	2,562,715	3,025,282
New York, New Jersey	2,187,733				
Pennsylvania	12,523,485	13,587,881	11,829,599	12,422,602	14,453,251
Maryland	705,377	805,373	954,763	1,050,876	1,166,204
Virginia	125,325	103,000			
Alabama	2,836,023	2,953,294	2,782,993	2,546,009	2,709,881
West Va., Kentucky	651,983	516,094	699,514	864,922	864,201
Tennessee	110,232	110,146	133,785	110,837	138,753
Ohio	8,862,646	9,359,275	8,502,459	9,098,739	9,795,648
Illinois	3,604,255	3,659,974	3,588,595	3,942,412	4,357,971
Indiana, Michigan	4,119,811	4,377,068	4,201,802	4,583,065	5,085,615
Wisconsin, Minnesota	468,479	537,499	455,727	339,267	379,162
Iowa, Colo, Utah	505,217	633,864	641,057	634,270	638,015
Total...Gross tons	36,700,566	39,372,729	36,565,645	38,155,714	42,613,983
Pig iron	36,116,311	38,698,417	35,858,232	37,401,648	41,757,215
Ferro-alloys	584,255	674,312	707,413	754,066	856,768

PRODUCTION OF PIG IRON AND FERRO-ALLOYS BY STATES, 1928–1929, SHOWING INCREASE OR DECREASE BY STATES.

States.	Production—Gross tons.					
	1929.	Per cent.	1928.	Per cent.	Increase.	Per cent.
Pig iron:						
Pennsylvania	14,016,015	33.57	12,052,405	32.22	1,963,610	16.29
Ohio	9,702,005	23.23	9,017,025	24.11	684,980	7.60
Indiana, Michigan	5,085,615	12.18	4,583,065	12.25	502,550	10.97
Illinois	4,357,905	10.44	3,942,412	10.54	415,493	10.54
Mass., New York	2,804,698	6.72	2,366,890	6.33	437,808	18.50
Alabama	2,704,733	6.48	2,517,485	6.73	187,248	7.44
Maryland, Virginia	1,124,762	2.69	1,028,596	2.75	96,166	9.35
West Va., Kentucky	862,001	2.06	862,706	2.31	*705	*.08
Colorado, Utah	602,106	1.44	600,366	1.61	1,740	.29
Wisconsin, Minnesota	379,162	.91	339,267	.91	39,895	11.76
Tennessee	118,213	.28	91,431	.24	26,782	29.29
Total pig iron	41,757,215	100.00	37,401,648	100.00	4,355,567	11.65
Ferro-alloys:						
Pennsylvania	437,236	51.03	370,197	49.09	67,039	18.11
New York, New Jersey	220,584	25.75	195,825	25.97	24,759	12.64
Ohio, Ill., Ia., Col	129,618	15.13	115,618	15.33	14,000	12.11
Md., Va., W. Va., Ala., Tenn	69,330	8.09	72,426	9.61	*3,096	*4.47
Total ferro-alloys	856,768	100.00	754,066	100.00	102,702	13.62
Grand total	42,613,983	.....	38,155,714	.....	4,458,269	11.68
Pig iron	41,757,215	97.99	37,401,648	98.02	4,355,567	11.65
Ferro-alloys	856,768	2.01	754,066	1.98	102,702	13.62

*Decrease.

PRODUCTION OF COLD, HOT, AND WARM BLAST CHARCOAL PIG IRON, GROSS TONS, 1925–1929.

Kinds of pig iron.	1925.	1926.	1927.	1928.	1929.
Cold blast	1,014	400	.....	.....	.....
Hot and warm blast	195,150	163,480	164,569	142,960	138,193
Total.....Gross tons	196,164	163,880	164,569	142,960	138,193

METHODS BY WHICH PIG IRON AND FERRO-ALLOYS WERE CAST OR DELIVERED IN 1929.

States.	Molten condition.	Sand cast.	Machine cast.	Chill cast.	Direct castings.	Total Gross tons.
Mass., N. Y., N. J., Maryland	2,294,174	105,979	1,725,488	16,496	373	4,142,510
Pennsylvania	10,935,009	185,255	3,027,137	301,745	4,105	14,453,251
Virginia, West Va., Ala., Ky., Tenn.	1,953,262	889,267	735,525	181,967	1,790	3,761,811
Ohio	6,744,429	22,498	3,011,223	1,800	15,698	9,795,648
Ind., Ill., Mich., Minn., Ia., Colo., Utah	7,635,286	114,637	2,702,924	66	7,850	10,460,763
Total..Gross tons	29,562,160	1,317,636	11,202,297	502,074	29,816	42,613,983

PRODUCTION OF PIG IRON BY GRADES AND FERRO-ALLOYS BY KINDS, 1928–1929, SHOWING INCREASE OR DECREASE.

Grades of pig iron and kinds of ferro-alloys	1929.	Per cent.	1928.	Per cent.	Increase.	Per cent.
Pig iron:						
Basic	24,911,654	59.66	22,124,410	59.15	2,787,244	12.60
Bessemer and low-phos.	9,877,240	23.65	9,013,847	24.10	863,393	9.58
Foundry	4,446,011	10.65	4,209,790	11.26	236,221	5.61
Malleable	2,312,813	5.54	1,922,970	5.14	389,843	20.27
Forge	167,930	.40	88,362	.24	79,568	90.05
All other pig iron	*41,567	*.10	42,269	.11	*702	*1.66
Total pig iron	41,757,215	100.00	37,401,648	100.00	4,355,567	11.65
Ferro-alloys:						
Ferro-manganese	476,655	55.63	419,213	55.59	57,442	13.70
Spiegeleisen						
Ferro-silicon	341,222	39.83	303,595	40.26	37,627	12.40
All other ferro-alloys	38,891	4.54	31,258	4.15	7,633	24.42
Total ferro-alloys	856,768	100.00	754,066	100.00	102,702	13.62
Grand total	42,613,983	.....	38,155,714	.....	4,458,269	11.68

*Decrease.

PIG IRON MADE FOR SALE BY GRADES AND BY STATES IN 1929

States.	Basic.	Bess. & low-phos.	Foundry.	Malleable.	Forge.	All other pig iron.	Total Gross tons.
Mass., N. Y., Md.	175,973	101,957	768,052	357,426	.....	100	1,403,508
Pennsylvania	805,929	394,121	612,812	128,269	46,374	.....	1,987,505
Va., W. Va., Ala., Ky., Tennessee	107,558	25,899	1,370,846	3,976	18,973	534	1,527,786
Ohio	599,520	24,118	691,560	712,674	35,800	.....	2,063,672
Ind., Illinois	466,200	21,616	347,731	559,529	.....	1,116	1,396,192
Mich., Minn., Utah	13,967	.....	321,648	298,788	.....	786	635,189
Total pig iron	2,169,147	567,711	4,112,649	2,060,662	101,147	2,536	9,013,852

PIG IRON AND FERRO-ALLOYS MADE FOR SALE OR FOR USE OF MAKERS IN 1929.

Pig iron and ferro-alloys.	For sale.	For maker's use.	Total. Gross tons.
Pig iron:			
Basic	2,169,147	22,742,507	24,911,654
Bessemer and low-phosphorus	567,711	9,309,529	9,877,240
Foundry	4,112,649	333,362	4,446,011
Malleable	2,060,662	252,151	2,312,813
Forge or mill	101,147	66,783	167,930
White and mottled, direct castings, etc.	2,536	39,031	41,567
Total pig iron.....Gross tons	9,013,852	32,743,363	41,757,215
Ferro-alloys:			
Ferro-manganese and spiegeleisen	240,728	235,927	476,655
Ferro-silicon	341,222		341,222
All other ferro-alloys	38,825	66	38,891
Total ferro-alloys.....Gross tons.	620,775	235,993	856,768
Total pig iron and ferro-alloys...G. T.	9,634,627	32,979,356	42,613,983

HALF-YEARLY PRODUCTION OF PIG IRON AND FERRO-ALLOYS ACCORDING TO FUEL USED.

Coke pig iron	208	150	141	291	21,337,150	20,281,872	41,619,022
Charcoal pig iron	5	5	3	8	67,504	70,689	138,193
Total pig iron	213	155	144	299	21,404,654	20,352,561	41,757,215
Total ferro-alloys	12	10	9	19	†415,406	†441,362	†856,768
Grand total	225	165	153	318	21,820,060	20,793,923	42,613,983

* Does not include the production of ferro-manganese, spiegeleisen, ferro-silicon, or other ferro-alloys.

† Includes ferro-manganese, spiegeleisen, ferro-silicon, and other ferro-alloys made in blast furnaces or in electric furnaces.

‡ During 1929 there were 20 blast furnaces which made ferro-alloys only or ferro-alloys and pig iron.

‖ Blast furnaces only; electric furnaces not included.

Iron Output Gained in March

Daily Rate Up 3060 Tons or 3 Per Cent—Net Increase of 4 Furnaces

RETURNS by telegraph and telephone gathered on Tuesday, April 1, from every active blast furnace except one, show that the production in March, estimated for the last day or two in some cases, made a substantial gain over February.

Estimated daily output in March was 104,450 gross tons as compared with 101,390 tons per day in February, a gain of about 3 per cent. The March total for 31 days was 3,237,950 tons, against 2,838,920 tons in February. The table below gives the totals for the last four months. The output in March was the largest since November, 1929, when it was 106,047 tons per day. In March, a year ago, the daily rate was 119,822 tons.

The preliminary returns show eight furnaces blown in and four blown out, a net gain of four. In January the net gain was seven.

Actual data will be published in THE IRON AGE for April 10.

Pig Iron Production by Districts, Gross Tons

	March (31 days)	Feb. (28 days)	Jan. (31 days)	Dec. (31 days)
New York and Mass.	217,177	184,985	193,367	176,191
Lehigh Valley	94,128	82,465	85,835	77,314
Schuylkill Valley	59,893	64,708	68,439	68,512
Lower Susq. and Lebanon Valleys	38,881	36,524	30,320	37,428
Pittsburgh district	670,100	576,427	613,745	609,148
Shenango Valley	68,309	63,825	47,518	48,425
Western Pennsylvania	124,170	107,210	100,256	103,671
Maryland, Va. and Ky.	132,956	109,587	98,331	98,296
Wheeling district	116,715	106,896	113,867	131,594
Mahoning Valley	283,004	251,262	220,567	220,143
Central and Northern Ohio	313,805	264,110	268,861	254,161
Southern Ohio	48,402	44,502	49,679	44,702
Illinois and Indiana	694,155	613,915	583,161	589,465
Mich., Minn., Mo., Wis., Colo. and Utah	129,380	116,505	130,146	141,869
Alabama	245,875	215,999	220,781	229,857
Tennessee	.....	.....	2,591	6,140
Total	3,237,950	2,838,920	2,827,464	2,836,916

Both Sides Claim Victory in Merger Fight

C. S. Eaton's Figures Disputed—Bethlehem Promises to Operate Sheet & Tube Separately

CHARLES M. SCHWAB, chairman, and Eugene G. Grace, president, of the Bethlehem Steel Corporation, have issued a statement that it will be the purpose of Bethlehem to develop and expand the business of the Youngstown Sheet & Tube Co. in the event that the proposed merger with Bethlehem is ratified by the stockholders on April 8. Their statement said:

"Bethlehem fully recognizes the value of the name Youngstown and the importance of maintaining the goodwill which the Youngstown Sheet & Tube Co. has developed through the wide distribution of its products. We wish to maintain these values to the utmost. Accordingly, the plan of merger contemplates that the Youngstown properties will be operated by a separate company to be known as the Youngstown Sheet & Tube Co. Such company will have its headquarters in Youngstown with resident executive officers.

Contemplate Youngstown Expansion

"One of our most important aims in entering this merger is to obtain an alliance with a large pipe and sheet manufacturing company to complement our present activities. We contemplate the development and expansion of the Youngstown plants in the largest possible manner that commercial conditions will warrant.

"We foresee a great future for the business of these plants and we believe that in combination with our other lines of manufacture the opportunities for such business will be of great advantage to all concerned.

"We are confident that the merger will result in increasing the payroll, the industrial facilities and the general prosperity of the Mahoning Valley."

C. S. Eaton Claims Victory

During the past week conflicting claims of victory in the merger fight have been issued by both sides. Cyrus S. Eaton, on behalf of the opponents of the merger, told the Youngstown Chamber of Commerce that 412,571 shares have been definitely lined up in opposition to the merger, and that 510,756 shares were in favor of it, leaving 262,273 shares still undecided at that time. A total of 395,201 shares is sufficient to block the merger.

James A. Campbell, chairman of the Youngstown Sheet & Tube Co., promptly disputed the correctness of these figures and reiterated his belief in the success of the merger plan when the final vote is taken.

In his statement to the Youngstown Chamber of Commerce, Mr. Eaton said:

"The proposed merger of the two companies would be of no great advantage to Sheet & Tube from the standpoint of markets or products. Actually, the benefits would flow to the Bethlehem Steel Corporation at the expense of Sheet & Tube stockholders. Clearly, the aim of Bethlehem's policy is to invade the rich market of the Middle West, and the Chicago district. Long considered as definitely entrenched in the East, the penetration into the West of this company threatens to upset the economic balance of the steel industry, resulting in conditions which would be detrimental to general prosperity.

Favors Alliance with Inland

"While I can speak with no authority with regard to the attitude of the Inland Steel Co., my own conviction is that Sheet & Tube would be much better off by forming an alliance with that company. It not only would obtain the diversification in products which it is seeking, but it would strengthen its position in the desirable Chicago district toward which all leadleading steel companies are now turning their eyes. Moreover, Sheet & Tube could benefit itself through a license agreement with Republic Iron & Steel Co. for the production of pipe by the Republic's electric welding process. Bethlehem, which is weak in its pipe business, can make no contribution to this important branch of Sheet & Tube's business.

"Sheet & Tube's management has always been regarded as one of the strongest and most able in the whole steel industry. Under the leadership of James A. Campbell, for whom I have always had the highest regard and admiration, the company has grown into the second largest independent in the United States. I do not believe that the Bethlehem Steel Corporation, or any other company in this country, could strengthen the traditionally fine management of the Sheet & Tube company."

A. O. Smith Corporation Working Three Shifts

The pipe mill of the A. O. Smith Corporation, Milwaukee, is working three shifts on present orders for 130,000 tons of oil and gas line pipe. This company reports that the prospects for steel pipe sales are excellent.

The corporation is looking forward to early releases against old orders which aggregate close to 250,000 tons of steel. The latest order, which was received on March 26, was for 281 miles of gas line pipe, this being the total mileage of the Montana-Dakota Power and Light Co. line through the above mentioned States. Among other orders at hand are the Moody-Seagrave system covering 600 miles and the Pure Oil Co. line of 190 miles.

The oil still business of the company is greatly improved due to recent orders and inquiries for pressure vessels are active.

PERSONAL

C. E. COOK, formerly branch sales manager at Detroit for the Square D Co., Detroit, has been appointed assistant sales manager of the company, in charge of sales of meter and entrance switches, as well as voltage testers. He is being succeeded by R. M. HEASLEY, heretofore sales representative at Grand Rapids, Mich. E. L. PITTENGER, sales manager at Pittsburgh, has been made assistant sales manager in charge of sales of Square-Duct and industrial safety switches. R. R. ECKENRODE of the Philadelphia office, has become Mr. Pittenger's successor at Pittsburgh, and GEORGE H. SCHUBERT has become sales representative at Grand Rapids. HENRY M. FOLEY has been added to the staff of the Detroit office.

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G. H. JEWELL, for a number of years assistant to the late W. D. Hess, has been appointed Western sales manager, with offices in the Peoples Gas Building, Chicago, of the Glamorgan Pipe & Foundry Co., Lynchburg, Va.

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GEORGE KIDD, chairman of the board of control of the British Columbia Electric Co., has been made a member of the board of directors of McLennan, McFeely & Prior, Ltd., Vancouver, B. C., wholesale iron, steel and hardware merchants.

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OSCAR W. LOEW, for the past six years director of advertising and sales promotion of the Truscon Steel Co., Youngstown, has been elected vice-president.

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H. W. GILLETT, director, Battelle Memorial Institute, Columbus, Ohio, will speak on "Fatigue" at the April meeting of the Cincinnati chapter of the American Society for Steel Treating at the Engineers' Club, Cincinnati, on April 3.

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L. A. GERBER, formerly western district sales manager of the United States Chain & Forging Co., Pittsburgh, has been made general sales manager, and W. L. REILLY, for many years a member of the headquarters staff, has been named assistant general sales manager. L. K. ROBINSON, who has been head of sales activities in New England, has become eastern district manager, with headquarters in New York, and HARLEY MORRIS has been made western district manager, with headquarters in Chicago. Mr. Morris was a former salesman in the western division.

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N. P. BASILEV, engineer; GEORGE AKIMOW, chief engineer; A. M. METLO, member of the council, all representatives of the Council of Civil Aviation of Moscow, U.S.S.R., were recent visitors at the Pratt & Whitney Aircraft Co., Hartford, Conn. plant.

B. KNIGHT of the Illinois Clay Products Co., Chicago, with an address on "Experiments in the Development of the Use of Synthetic Sand" was on the program at the Schroeder Hotel, Milwaukee, on April 2, of a meeting of the Wisconsin Gray Iron Foundry Group.

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ARTHUR APPLETON, for the past five years New York district representative of the Box Crane & Hoist Corporation, Philadelphia, has retired from active business and will sail May 3, on the Laconia for an extended trip in England and on the Continent. He has been engaged in the sale of overhead cranes for more than 40 years, beginning in 1889 with William Sellers & Co., Philadelphia, selling both cranes and machine tools. At that time the rope-driven crane was being displaced by the overhead crane driven by a shaft along the floor and some years later the electric crane with a single motor for all operations was built. In 1906 he joined the sales organization of the Pawling & Harnischfeger Co., Milwaukee, now the Harnischfeger Corporation, and in 1912 resigned to represent the Toledo Bridge & Crane Co., Toledo, Ohio, in the New York district, continuing until that company was acquired by the Austin Machinery Co. During that period he represented the Roeper Crane & Hoist Corporation, Reading, Pa., and in 1919 the Reading Chain & Block Corporation, until 1925 when he became connected with the Box company.

ARTHUR APPLETON

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B. VAN DYKE of the Quincy, Ill., sales division of the Gardner-Denver Co., has been transferred to the New York office of the company. HENDRICK STOLK, until recently with R. S. Stokvis & Sons, Holland, has been transferred to the St. Louis office from the Quincy plant.

R. S. COULTER, who for the past 11 years has been combustion engineer at the Sparrow's Point plant of the Bethlehem Steel Co., has resigned his position to engage in private practice as consulting combustion engineer. His headquarters will be in Lebanon, Pa.

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J. R. MORRIS, chief metallurgist, Central Alloy Steel Co., Massillon, Ohio, addressed the Worcester, Mass., chapter of the American Society for Steel Treating, April 2, on "Alloy Steels."

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H. P. HALLADAY, who has been connected with the sales department of the American Forging & Socket Co., Pontiac, Mich., has been placed in charge, as district sales manager, of the newly-established Chicago office of the company.

—

LOUIS W. SUMNER has been appointed Michigan representative in the Bank of Michigan Building, Detroit, for the Bellis Heat Treating Co., Branford, Conn., and his office will be a sales and service office as well as warehouse.

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L. SETH SCHNITMAN, chief of division of the Survey of Current Business in the Department of Commerce, has resigned and accepted a position as chief statistician in the division of statistics and research of the F. W. Dodge Corporation, New York. In his new position, Mr. Schnitman will be associated with THOMAS S. HOLDEN, vice-president in charge of statistics, in the enlargement of the research of the Dodge organization, and took up his work in this capacity on April 1.

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JOHN S. WALKER, JR., manager of the Huntington, W. Va., branch of the Sullivan Machinery Co., since it was established in 1912, has retired to engage in the banking business in Huntington, and has been succeeded by MORLEY S. SLOMAN, who has been associated with the Pittsburgh office of the Sullivan Company for the past 14 years.

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EDWARD F. WICKWIRE, vice-president of the Ohio Brass Co., Mansfield, Ohio, was the guest last week of the New England Street Railway Club, at Boston, where he spoke on "What Price Public."

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E. E. SPENCER, president, Stromberg Electric Co., sailed for Europe on the Berengaria, March 31, to establish representatives for his company in seven foreign countries.

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WALTER E. MILLER resigned as vice-president and FRANK M. BOUGHEY retired as secretary at the annual directors' meeting of Fairbanks, Morse & Co. F. C. DIERKS, former assistant secretary, was chosen secretary. No successor to Mr. Miller was named. All other officers were reelected.

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C. C. STEINHAUER has been named

manager of a district office and warehouse opened at Birmingham by John A. Roebling's Sons Co., Trenton, N. J.

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DR. O. FRITZSCHE, professor in the Hochschule at Freiberg, Saxony, Germany, arrived in the United States on the Europa last week as a delegate from his institution to the fiftieth anniversary celebration of the American Society of Mechanical Engineers, April 5 to 8. He will spend some weeks in the United States visiting various steel centers.

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CHESTER J. BOON, formerly assistant manager of sales, in Cincinnati, of the American Steel and Wire Co., has been promoted to manager of sales. Mr. Boon has been with the company for about 20 years and went to the Cincinnati office shortly after the war.

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J. C. WILLIAMS, president, Weirton Steel Co., Weirton, W. Va., and C. A. COLLINS, president Hanna Furnace Co., Buffalo, have been added to the executive committee of the National Steel Corporation, Pittsburgh. Other members of the committee are E. T. WEIR, GEORGE R. FINK and GEORGE M. HUMPHREY, who are respectively chairman of the board, president and chairman of the executive committee of the National corporation.

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PAUL D. MERICA, research director, International Nickel Co., New York, sailed on the Olympic last week for a trip of several weeks in Europe.

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PRESIDENT and MRS. HOOVER entertained CYRUS S. EATON, Cleveland financier, and his two daughters at dinner in the White House, Tuesday evening, April 1.

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PHILIP B. GALE has been made chairman of the board of the Hartford Machine Screw Co., Hartford, Conn., and has been succeeded as president by H. E. PENFIELD, who has been vice-president for many years and located in Chicago. W. D. CORLETT has been made vice-president.

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JAMES W. HAMILTON, since 1927 assistant secretary of the Carnegie Steel Co., Pittsburgh, has been elected secretary to succeed the late James J. Campbell. WILLIAMS DONALD, who has been assistant auditor of the company, becomes assistant secretary and auditor, while JOHN H. DORNING has been named assistant auditor. Mr. Hamilton was born in Pittsburgh, and graduated from Kenyon College, Gambier, Ohio. He became indentified with the Carnegie company in 1912 as assistant to L. H. BURNETT, now vice-president of the company, and served in various capacities prior to 1927. Mr. Donald has been identified with the company's auditing and bookkeeping departments since 1905, while Mr. Dorning began his association in 1898.

J. G. Pearce Will Deliver British Exchange Paper

J. G. Pearce, director and secretary of the British Cast Iron Research Association, has been chosen to present the annual exchange paper of the Institute of British Foundrymen before the May meeting of the American Foundrymen's Association.

Mr. Pearce's paper will be on "Correlation of Tests for Cast Iron," a subject on which he is one of the world's authorities. Following graduation from the University of Birmingham, he spent two years in the works and offices of the British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester. This firm, with which Mr. Pearce was associated for some years, subsequently became the Metropolitan - Vickers Electrical Co., Ltd., the leading member of the group now known as Associated Electrical Industries, Ltd.

J. G. PEARCE

At the end of his apprenticeship, following a period spent on engineering design, Mr. Pearce assisted A. P. M. Fleming in the establishment of a new department, subsequently called the research and education department, which in a few years became a model of its kind. The experience gained was embodied in two books written jointly with Mr. Fleming, "The Principles of Apprentice Training" and "Research in Industry." After some experience in Europe, Mr. Pearce in 1923 spent about seven months in the United States and Canada as liaison engineer to Metropolitan-Vickers, Ltd., to maintain contact with the various plants of the Westinghouse company.

Since 1924 Mr. Pearce has been director and secretary of the British Cast Iron Research Association. This is an organized technical body for promoting research and development in the ferrous founding industry and since that date it has made notable progress. In 1928 he was awarded the first prize in an open competition in Great Britain, judged by representative leaders of capital, labor and management, for an essay on the most practicable methods for promoting good-will in industry.

Obituary

ERNEST F. EURICH, organizer and for a number of years general manager of the Chicago & Aurora Smelting & Refining Co., died recently at Utica, N. Y. He was born in Berlin, Germany, in 1847, and came to America when a young man. He was graduated from the College of the City of New York in 1866.

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EUGENE MAXWELL MOORE, vice-president and a director of Manning, Maxwell & Moore, Inc., New York, died in New York after a brief illness, March 27, aged 39 years. He was the son of Charles A. Moore, one of the founders of the company and had been actively connected with the company since 1913.

DAVID P. THOMPSON, assistant to the president and a director of the Inland Steel Co., whose death March 24 at Miami Beach, Fla., was reported in THE IRON AGE of March 27.

WILLIAM D. TAYLOR, president, George Worthington Co., Cleveland, wholesale hardware dealer, died March 30, aged 80 years. He had been connected with the company since 1866. He became vice-president in 1906 and had been president since 1911. He served a term as president of the National Hardware Association.

Production of automobiles in Canada in February is reported by the Dominion Bureau of Statistics at 15,548 units, an increase of nearly 50 per cent over the January total of 10,388 units. The February total, however, was less than half that of a year earlier, when 31,287 vehicles were produced. Imports in February were 1893 units, and exports, 4280.

A. I. FINDLEY
Editor

THE IRON AGE

W. W. MACON
Managing Editor

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Initiative in a Depression

MONEY is easier—what is needed is the courage to use it. This was the burden of recent remarks by Governor Young of the Federal Reserve Board, who urged "more initiative and less hesitancy," saying that credit is only a "contributory factor toward reviving business" and that the real responsibility rests with "the men who are engaged in the business of agriculture, industrial production and wholesale and retail trade."

His advice has been challenged on the ground that the individual business man is as bold and enterprising as conditions warrant. It is to no avail to force activity in the face of the overproduction and satiated demand, with unsold goods still hanging over the market, it is asserted. It is held to be futile to speed up the flow of goods, when unemployment has cut down the number of potential consumers, and it is likewise contended that individual efforts to stimulate business have little chance in the face of a depression that is of world-wide proportions. Finally, it is pointed out that the reduction in interest rates has been limited mainly to the financial markets and has not extended to localities where bank deposits are falling, bank funds are frozen in collateral loans to customers and business uncertainty is discouraging both borrowing and lending.

This criticism has considerable foundation, but much can also be said to justify Governor Young's position. Business depression, in this country at least, has not affected all parts of our business fabric with equal force. Some of our largest industries got through the stock market panic with large cash reserves and without heavy, high-priced inventories. They have been able to go ahead with long-range programs without financial embarrassment and many of them have proceeded with their expenditures without stint. But for the outlays of railroads, public utilities and other large aggregations of private capital, the rate of steel ingot output would not now be at three-quarters of capacity.

Surely no objection can be raised to urging those corporations and those individuals who are able to add to the sum total of business activity to do so, and, interpreted in that light, Governor Young's advice is sound. No artificial stimulation is in order—to make work for work's sake is not sound economics—but it is recognized that a considerable margin always separates total demand from total potential buying power. Those who merely feel poor, because of paper losses in securities or the spirit of the time, can alter their psychology to the advantage of general business. Even slight changes in the volume of buying, when multiplied many times, have far-reaching effects on the state of industry and trade.

Neither optimism nor pessimism is wanted at the present juncture, but rather a degree of confidence that fully measures up to conditions as they actually exist. Fear, if given free rein, will make a perplexing situation worse. Excessive caution on the part of the lender will stifle legitimate enterprise. Undue timidity on the part of the prospective borrower will mean inaction at a time when every unnecessary delay slows up the wheels of trade and aggravates the unemployment problem.

In calling for courage and initiative one need not be blind to present economic limitations. Business men are always hemmed in by restrictions, but they are never so hamstrung that they are mere puppets.

The Fall of Silver

TIME was when silver was a noble metal. Political contests were fought over it. The Great Commoner won a Presidential nomination by his oratorical protest against its crucifixion upon a cross of gold, figuratively speaking. The maintenance of its value per ounce at one-sixteenth of that of an ounce of gold was akin to a holy crusade. But the laws of economics were against it. Yet during the Great War miraculously, so it seemed, it regained the position it held before the Great Crime, so called. Soon afterward, however, it began to fall again and this year it has been at the lowest price of record, it having come to pass that 50 ounces of silver are required in exchange for an ounce of gold. And there is no convincing expectation of recovery.

The final blow was dealt when recently the Indian Government imposed an import duty upon silver and ipso facto converted it from a noble metal into a mere article of commerce. Already we are beginning to think of its value in terms of the pound avoirdupois instead of the ounce troy. Thinking of it in the new way, the producers are studying the subject of increasing its commercial uses, the greatest of which at present are in photography and plating for domestic purposes.

An offhand idea is naturally that people will now buy tableware of sterling silver instead of silver plate, but the experts say that this idea is of no merit. A few people will enjoy the new opportunity, but the producers have to contemplate quantity consumption and they appreciate that the masses no longer live in houses of their own, or, if they do, they have no ser-

vants to take care of silverware, and so they do not want it.

Consequently, major attention is being directed toward studying the possible benefits of alloying other metals with small proportions of silver. For certain purposes copper is distinctly improved by the introduction of 0.1 per cent of silver. With such thoughts a new field of technical investigation is being entered. But what a fall of the mighty, which once stirred political animosities, produced a voluminous argumentative literature and swayed the policies of nations!

Steel Profits Per Ton

DIVIDING the Steel Corporation's earnings by tonnage of steel products shipped gives an apparent or conventional quotient of earnings per ton. The showing is not accurate in that all the earnings cannot be attributed to the steel, but the so-called "outside earnings" are relatively small, and when comparison is made merely between different years for the Steel Corporation, and not with other steel companies, it is quite trustworthy.

Such a computation shows $13.83 a ton for 1928 and $16.98 for 1929, or $3.15 increase. The annual report states that prices received on shipments, comparing an equal tonnage of similar products, increased only 38 cents a ton, this being made up of 23 cents increase on domestic and $2.22 on export shipments. Thus there is $2.77 to be accounted for otherwise. Obviously that was a reduction in "cost" but the reference in itself means nothing. Costs fluctuate according to various influences, the three principal influences being the total tonnage, the character of orders or the manner in which they are filled, and improvements in equipment and practice. The last named is permanent, while the others fluctuate.

Following the post-war deflation maximum market prices for steel were reached in the fore part of 1923, though on account of execution of old engagements in 1923 it was 1924 that showed the higher prices realized on shipments. Then there were decreases through 1928, last year showing, as stated, only a slight increase.

In those years of declining realized prices the Steel Corporation's apparent earnings per ton varied but slightly. In the whole six years—1923 to 1928 inclusive—they did not go below $12.36 (1925) nor above $13.92 (1926), whereas from 1928 to 1929 they jumped $3.15, cost per ton apparently decreasing $2.77.

In view of the previous course of affairs one cannot imagine that any large part of this $2.77 was attributable to permanent reduction through improvements. The 9 per cent increase in total tonnage brought about much wider distribution of running expenses, including more items than are commonly included in the strict term "overhead." The average number of employees increased only 1½ per cent, total wages and salaries increasing in substantially the same measure.

The mere 9 per cent increase in tonnage does not represent the whole story. The operating rate increased only about 7 per cent, being stated at 83.4 per cent of capacity in 1928 and 89.2 per cent of capacity in 1929, capacity having evidently increased 2.4 per cent. An increase has a different influence according to how facilities are employed in general. From a 70 to a 77 per cent rate there is 10 per cent increase and from an 80 to an 88 per cent rate there is also a 10 per cent increase, but the cases are different:

With a relatively low operation there are numerous small orders to be filled promptly. With a relatively high operation buyers are specifying larger unit shipments and sometimes they get them when they do not so specify, mills being scheduled for longer runs of given sizes. During much of last year there was a special advantage to mills in being able to schedule large and economical runs.

No doubt there were substantial decreases in costs last year in ways that will prove permanent, but the principal gain in per ton earnings was due to the large tonnage, reducing costs for that particular year in several ways.

Advertising a City

FOUR years ago the business men in Atlanta, Ga., organized and generously financed a movement to advertise their city. The object was two-fold:—to advertise their city to their fellow citizens, and to advertise their city to the United States at large. The first was designed to counteract the get-rich-quick lure of the Florida boom. How effective has been the second effort may be judged from the current report of the Forward Atlanta Commission.

Since 1925 about $700,000 has been subscribed for this propaganda, of which 80 per cent has been spent for advertising in various media, 10 per cent for the preparation of special surveys in response to inquiries, and 10 per cent for administration. About 10,000 inquiries a year have been drawn from the advertising. Many resulted in a personal or business move to Atlanta.

It is notorious that the effect of advertising is hard to evaluate. Much of it is bought on faith (but as a matter of fact, faith in well designed and well planted advertising is warranted). For those who want definite data, the results achieved by Atlanta are illuminating.

Industrial census figures, dating back to 1904, indicate that the number of new firms and branches established in Atlanta had been growing slowly, year by year. For instance, in 1921 the list showed a net increase of 41 names. By 1925 the annual accession had grown to 60. But in 1926, the first year the Forward Atlanta Commission swung its advertising into action, 155 new firms were attracted to the city. This good record has been continued; 158 opened business establishments in 1927, 175 in 1928 and 191 in 1929. It is calculated that nearly 400 of these represent the accessions above the natural growth attracted by the advertising.

Another indication of the new prosperity which this city is enjoying is drawn from the index of retail sales published monthly by the sixth Federal Reserve Bank. Up to 1925 the index for Atlanta was approximately identical with the index for the rest of the district. Since that date, however, the index for Atlanta (based on average for 1923 to 1925) has

steadily increased until now it is 60 per cent higher than that of the neighboring cities.

One who has visited in Atlanta knows that it enjoys many natural advantages. The citizens are hospitable, and the pace of life is not too strenuous. It is a good place to live in. But these advantages would doubtless be unknown to the business world—which is pretty much of a stay-at-home group, after all—unless a forceful and consistent advertising campaign had broadcast the facts.

Heavier and Heavier Rails

NOTWITHSTANDING the fact that total production of steel rails in the United States last year had been exceeded in three of the four preceding years, the 1929 output of rails of 120 pounds a yard and heavier established another high record. Also, the total of all rails 100 pounds and over made a new high record. Meanwhile the tonnage of 85 to 100-pound rails was the lowest ever reported for that classification, and was only one-third as great as in 1916. And the total for 50 to 85-pound rails made a new low record, at less than one-half the total of 1926 and all preceding years for perhaps a half-century.

There were other significant facts brought out by the figures released this week by the American Iron and Steel Institute. The percentage of open-hearth steel rails to the total has gone up to 97.80, the highest ever reached and a full point above 1925-1926-1927. Electrically melted steel accounted for 723 tons, the largest amount since the heavy experimental tonnages of 1912 and 1913. But alloy-treated rails were less than one ton for each 1400 tons made, reaching the lowest total—save in 1927—in more than twenty years.

Rerolled rails have been declining in tonnage almost steadily since 1923, when the amount was more than double that of last year. They represented a little over 2 per cent of the total production last year, compared with above 5 per cent six years earlier.

To what extent the increasing vogue of heavier rails will affect future output remains to be seen. Each mile of track laid will call for a larger tonnage, naturally. But the rails should last longer, and thus defer necessity for replacement. Between these two tendencies a balance will necessarily be struck which may hold our rail needs fairly constant. That this may prove true is suggested, at least, by the fact that last year's output, in a year of the breaking of many records, was within ½ per cent of the average of the seven preceding years.

CORRESPONDENCE

Subdivision of Metric Units

To the Editor: In a late issue Frank Mossberg comments on the use or, rather, the lack of use of the metric system in this country. He presents only one side of the story. For example, he states that 90 per cent of the civilized countries use the metric system, but neglects to add that the two that do *not* do more business than all the rest put together.

The founders of this country were not unaware of the advantages of using 10 as a basis: witness our coinage, also our ton and hundred-weight, compared with the English units. Our $10 gold piece is almost an exact metric unit, and our 5c. piece is absolutely so.

As a matter of fact, the metric system is more convenient in the laboratory than in the plant. Unskilled labor can read the Fahrenheit thermometer to a degree easily. They do not handle the Celsius scale so readily because the units are nearly twice as large and the tenths are hard to read. The same is true of the Baumé scale. The petroleum trade sticks to both, though the preliminary work is done in metric units. Thus the specifications on New Navy gasoline: initial not over 131 deg. Fahr., end point under 437 deg. Fahr. As a matter of fact, these points were worked out as 55 deg. C. and 225 deg. C. and translated for convenience.

In one chemical plant we loaded out barrels 400 lb., 441 lb. and 448 lb. The first unit gave us an American ton in 5 barrels. The second was 200 kilograms and the third gave us an English ton in 5 barrels for the Canadian, South African and Australian trade.

I think the founders of our American system discarded the English gallon for the present style because it was an existing unit, and approximated 4 liters within 5 per cent.

An Army officer published a little book some years ago, entitled "The Fallacy of the Metric System." One of his arguments was that the simplest way to divide a unit is to halve it. Applying this to the metric system we get: 10, 5, 2½, 1¼, ⅝, 5/16, etc. With the avoirdupois pound we have 1 lb., 8 oz., 4 oz., 2 oz., 1 oz., ½ oz., etc. I would like to see anyone take a kilogram of sugar, for example, and subdivide it into tenths, using a scraper and his eye; yet it is easily divided into eighths, and with a fair degree of accuracy.

Any of us who has followed laboratory work into the plant for any length of time can think in meters, yards, kilograms, tons, Centigrade, Fahrenheit, Baumé or thousandths equally well, provided he knows which is under discussion.

The expense of changing over to metric from our present standard is not great in a great many businesses. Witness the above example. The only great drawback I can think of is in changing our screw and pipe threads to the metric system.

L. R. BAKER.

559 West Washington Boulevard,
Chicago, March 12.

Corrosion of Copper-Bearing Steels

IN the rusting of copper-bearing steels in natural waters, the first step is claimed to be the solution of the outer layer of steel and the immediate precipitation of the copper ions by iron, say Carius and Schulz in *Stahl und Eisen*, No. 49, 1929, pages 1798-1799. This causes a coating of copper on the surface, which at first appears a coppery shade, showing interference colors, but soon is converted to black copper oxide. This coating is tougher than ordinary rust and prevents further attack on the metal.

Under certain conditions, the deposited copper, instead of forming an adhering layer, assumes a spongy form. In this case local action between the sponge and the iron results in the formation of a green ferro-ferrite, which covers the steel and acts to prevent corrosion.

It is stated that under atmospheric attack the presence of the coating of copper oxide results in a 50 per cent longer life.

The Week in Business

Drift of Current Financial and Economic Opinion

SUPPLY and demand are cited by Alexander Hamilton Institute in explaining the conflicting movements of business during the past three months. "It is now more apparent that the recovery during the first six weeks of the year was due to the fact that the decline in December was more drastic than warranted by curtailment of demand. The recovery merely reestablished the balance between production, which declined 15 per cent, and consumption, which declined only 10 per cent. Since demand has shown no particular revival, the upward trend of manufacturing was limited to a level below that of last year. . . . It is evident that business has already reached the bottom of the major slump and is now pounding up and down along this level."

Along this same line the Harvard Economic Service says "Steady month-by-month increases in our manufacture index were not to be expected, following such a sharp advance as took place after the end of last year. But it seems clear that manufacture reached bottom in December and that any interruption [in recovery] which may occur will be minor in extent and of brief duration."

How Long Shall We Drag Bottom?

This question of the breadth of the valley along which we have been moving has stirred many commentators. The Guaranty Trust Co. observes that, "in spite of considerable improvement in business sentiment and definite establishment of some of the fundamentals of recovery, industrial revival has made only moderate progress. While it seems likely that the depth of the depression has been reached, its width is not yet clearly evident. . . .

"Yet the economic needs of 120,000,000 people must be met. With the processes of readjustment through which we are going reasonably well completed, a definite move forward may be expected. Whether this will be delayed until mid-summer, or even until autumn, is not clear, but that the problem involved is purely one of time, and not of direction, appears certain."

Optimism is thus expressed by *Business Week:* "Business news itself is still a bit chilly. . . . Building, now definitely and strongly on the rise, is the real sunshine of the season. As it warms up, it is sure to start some of the spring freshets of trade, still slow in thawing out. . . . But the frost cannot linger long under the showers of easy money and the returning warmth of building activity."

Road Building Not an Unmixed Blessing

In so far as construction activity involves community work on roads, highway bridges, etc., *Annalist* looks on it askance. "Local road and bridge construction mean higher local taxes," writes Benjamin Baker, "so that, in effect, those workmen helped from the wages they get for such work cost the taxpayer much more than the money benefits to the workmen. . . . Local taxes do not raise the buying power of the individual consumer.

"Evidence from every side," continues this commentator, "shows that the business and speculative activity of last year, extending to every field, has not yet been fully liquidated. To start a new game on borrowed chips is assuredly not good business policy," he argues.

Easy money receives considerable attention. "It is clear," says Theodore H. Price, "that a plethora of credit is being accumulated all over the world, and that money is likely to cost little for some time to come. This will immensely encourage the business revival for which most of the forecasters are looking . . . A period of hard times that would last more than a year has become almost unthinkable in this country."

However, Alexander Hamilton Institute thinks that "the present low interest rates are the effect of slack business and some time must yet elapse before business is sufficiently readjusted to be stimulated by easy money. . . . No conspicuous further decline [in commodity prices] is in immediate prospect," continues this review, "and there is good possibility of a slight recovery during the second quarter."

New Lineup of Industry Visioned

Economic readjustment is thus viewed by the Chamber of Commerce of the United States: "There are unmistakable signs that business is breaking away from old moorings and setting out upon a new course. Mergers in many fields and group operations are crystallizing economic units on a colossal scale. Retailing is undergoing tumultuous changes.

"Transportation is turning to the air and, after many years, back again to waterways. Communities are approaching industrial expansion from the viewpoint of growth from within, rather than development from without. Industries are setting new standards of trade practice."

Republic Electric Welded Pipe Unit Progressing

In its annual report for 1929 the Republic Iron & Steel Co. says that construction work on the units to manufacture electrically welded pipe under the Johnston patents is progressing, and it is expected that the units up to and including 16 in. pipe will be completed by May 1, and the larger units soon thereafter.

The company reports net profit for last year of $9,780,043, after providing for depreciation, bond interest, Federal taxes, etc. Preferred and common stock dividends paid during the year totaled $5,109,390. The surplus account as of Dec. 31 was $32,144,099.

Molybdenum Corporation Buys York Company

The Molybdenum Corporation of America, Pittsburgh, has acquired the York Metal & Alloy Co., York, Pa. The York company produces ferrotungsten in a small way, but is largely a manufacturer of tungsten and molybdenum chemical compounds, which have not heretofore been produced by the Molybdenum Corporation.

The Molybdenum Corporation, in its first public annual report, shows net profits for the year ended Dec. 31, 1929, of $270,739, after interest, depreciation, depletion and reserves for Federal taxes, equal to 67c. a share earned on the 404,070 shares of common stock outstanding. In 1928 the company had a net loss of $843. The mine of the company is running full at present, but the plant at Washington, Pa., is working at 40 per cent of capacity on account of the current light demand for ferrotungsten.

Iron and Steel Markets

Pig Iron Output Higher in March

Gain in Daily Rate Is 3 Per Cent—Steel Ingot Production Up Again—Steel Pipe Reduced $4 a Ton—Ore Prices Reestablished

PIG iron production in March, in contrast with the decline in steel ingot output, increased 3060 tons a day, or 3 per cent, according to preliminary estimates telegraphed to THE IRON AGE. Total production for the month was 3,237,950 tons and the daily average was 104,450 tons, compared with 2,838,920 tons and 101,390 tons, respectively, in February. The daily rate is the highest since last November and compares with 119,822 tons for March a year ago.

Eight blast furnaces were lighted in March and four were put out, a net gain of four. The increase in active capacity is in keeping with the current upward trend in steel works output. The steel ingot output of Steel Corporation subsidiaries has risen to 83 per cent, and the average for the country at large has advanced to 78 per cent, compared with 76 per cent a week ago.

Expanding demand for line pipe from the larger oil and gas companies, large structural steel inquiries, a more cheerful outlook in the automobile industry and a further moderate increase in steel specifications from miscellaneous sources have raised the hopes of the mills. But no sharp rebound in activity is looked for; on the contrary, some producers, doubtless influenced in their views by the hand-to-mouth character of buying and the persistence of price unsettlement, believe that the industry will do well to hold its recent gains.

Throughout the winter months the heavier rolled products formed the backbone of mill schedules and it is open to question whether they will continue to be in such active demand. Rail mills will run at a good rate throughout the first half and railroad car builders are assured active operations until mid-year, but miscellaneous steel bookings from the railroads have tapered. The outlook for further rolling stock purchases is still considered uncertain, but the placing of 91 passenger cars by the Van Sweringen lines and an imminent inquiry from the Illinois Central for 2300 cars are encouraging developments.

The trend of structural steel business is also regarded as an unknown quantity. After several lean weeks, fabricated steel inquiries aggregate 68,000 tons, the largest total so far this year. However, a single project, a New York elevated highway, accounted for 23,000 tons. Awards for the week were small, amounting to only 22,000 tons.

Taking into account a possible contraction of trade in heavy rolled products, indications of expanding demand for lighter products are gratifying. Sheet specifications have been very good from consumers outside of the automotive industry. In fact, with very little support from motor car builders, sheet mills find it possible to operate at 70 per cent.

Only a recovery of automobile manufacture is necessary to bring sheet output within striking distance of capacity. Larger melt by automotive foundries and somewhat more liberal releases of sheets, strips and bars by motor car makers tend to support the view that April automobile production will show a moderate gain over March. Output last month was below that of either January or February and was only 45 per cent of the total of March, 1929.

Line pipe bookings have been swelled by the placing of 24,000 tons for two gas lines in Montana and North Dakota with the A. O. Smith Corporation. The Milwaukee fabricator is now operating on three shifts. Numerous other projects are before the trade. Oil storage tanks, calling for fully 25,000 tons of plates, are pending, and demand is active for heavy-walled pressure vessels for oil refinery use.

Finished steel prices have undergone further reductions. An increase in pipe discounts equivalent to a reduction of $4 a ton is the first general revision of the prices of tubular goods since April 19, 1923. To a large extent the new quotations represent an open recognition of widespread recent concessions. Bars are now more generally quoted at 1.80c., Pittsburgh, or $1 a ton below recent asking prices, and pronounced weakness in wire nails has resulted in sales at $2.15 and $2.20 a keg, representing concessions of $1 to $2 a ton. Hot-rolled strip is off another $1 a ton to 1.70c. for wide and 1.80c. for narrow.

Pig iron demand is still spotty, but on the whole is gaining. March shipments from Chicago furnaces led those of February by a comfortable margin. Price competition is keen, with Alabama iron dipping to $12, Birmingham, on a New England sale.

Lake Superior ore prices have been reestablished at last year's level on open market sales of 2,000,000 tons. In 1929 ore prices advanced 25c. a ton after remaining stationary for four years.

THE IRON AGE composite price for finished steel has declined from 2.312c. to 2.264c. a lb., its lowest level since August, 1922. It is almost $3 a net ton below its peak in 1929. The pig iron composite, unchanged at $17.75 a gross ton, is 71c. lower than a year ago.

A Comparison of Prices

Market Prices at Date, and One Week, One Month and One Year Previous, Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron, Per Gross Ton:	Apr. 1, 1930	Mar. 25, 1930	Mar. 4, 1930	Apr. 2, 1929
No. 2 fdy., Philadelphia	$20.26	$20.26	$20.26	$21.76
No. 2, Valley furnace	18.50	18.50	18.50	18.00
No. 2 Southern, Cin'ti	16.69	16.69	16.69	19.19
No. 2, Birmingham	14.00	14.00	15.00	15.50
No. 2 foundry, Chicago*	19.50	19.50	19.50	20.00
Basic, del'd eastern Pa	19.00	19.00	19.25	20.25
Basic, Valley furnace	18.50	18.50	18.50	17.50
Valley Bessemer, del'd P'gh	20.76	20.76	20.76	20.26
Malleable, Chicago*	19.50	19.50	19.50	20.00
Malleable, Valley	19.00	19.00	19.00	18.50
L. S. charcoal, Chicago	27.04	27.04	27.04	27.04
Ferromanganese, furnace	94.00	94.00	94.00	105.00
Rails, Billets, Etc., Per Gross Ton:				
Rails, heavy, at mill	$43.00	$43.00	$43.00	$43.00
Light rails at mill	36.00	36.00	36.00	36.00
Rerolling billets, Pittsburgh	33.00	33.00	33.00	34.00
Sheet bars, Pittsburgh	33.00	33.00	33.00	35.00
Slabs, Pittsburgh	33.00	33.00	33.00	34.00
Forging billets, Pittsburgh	38.00	38.00	38.00	39.00
Wire rods, Pittsburgh	38.00	38.00	38.00	42.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb.	1.85	1.85	1.85	1.85
Finished Steel, *Per Lb. to Large Buyers:*	Cents	Cents	Cents	Cents
Bars, Pittsburgh	*1.80*	1.85	1.85	1.95
Bars, Chicago	1.95	1.95	1.95	2.05
Bars, Cleveland	1.85	1.85	1.85	1.95
Bars, New York	*2.14*	2.19	2.19	2.29
Tank plates, Pittsburgh	1.80	1.80	1.80	1.95
Tank plates, Chicago	1.90	1.90	1.95	2.05
Tank plates, New York	2.07½	2.07½	2.07½	2.22½
Structural shapes, Pittsburgh	1.80	1.80	1.80	1.95
Structural shapes, Chicago	1.90	1.90	1.95	2.05
Structural shapes, New York	2.04½	2.04½	2.04½	2.19½
Cold-finished bars, Pittsburgh	2.10	2.10	2.10	2.30
Hot-rolled strips, Pittsburgh	*1.70*	1.75	1.80	1.90
Cold-rolled strips, Pittsburgh	2.55	2.55	2.65	2.75

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

Finished Steel, *Per Lb. to Large Buyers:*	Apr. 1, 1930 Cents	Mar. 25, 1930 Cents	Mar. 4, 1930 Cents	Apr. 2, 1929 Cents
Sheets, black, No. 24, P'gh	*2.55*	2.65	2.65	2.85
Sheets, black, No. 24, Chicago dist. mill	2.65	2.75	2.75	3.05
Sheets, galv., No. 24, P'gh	3.30	3.30	3.30	3.60
Sheets, galv., No. 24, Chicago dist. mill	3.40	3.40	3.40	3.80
Sheets, blue, No. 13, P'gh	2.25	2.25	2.25	2.20
Sheets, blue, No. 13, Chicago dist. mill	2.35	2.35	2.35	2.40
Wire nails, Pittsburgh	*2.20*	2.25	2.25	2.65
Wire nails, Chicago dist. mill	2.35	2.35	2.35	2.70
Plain wire, Pittsburgh	2.40	2.40	2.40	2.50
Plain wire, Chicago dist. mill	2.45	2.45	2.45	2.55
Barbed wire, galv., Pittsburgh	2.95	2.95	2.95	3.30
Barbed wire, galv., Chicago dist. mill	3.00	3.00	3.00	3.35
Tin plate, 100 lb. box, P'gh	$5.25	$5.25	$5.25	$5.35
Old Material, Per Gross Ton:				
Heavy melting steel, P'gh	$16.25	$16.25	$16.75	$18.75
Heavy melting steel, Phila	14.50	14.50	15.00	17.00
Heavy melting steel, Ch'go	13.00	13.00	13.25	16.00
Carwheels, Chicago	14.50	14.50	15.00	14.50
Carwheels, Philadelphia	15.00	15.00	15.00	16.50
No. 1 cast, Pittsburgh	14.50	14.50	14.50	15.50
No. 1 cast, Philadelphia	15.00	15.00	15.00	16.50
No. 1 cast, Ch'go (net ton)	13.75	13.75	13.75	16.00
No. 1 RR. wrot., Phila	15.00	15.00	15.00	16.00
No. 1 RR. wrot., Ch'go (net)	12.25	12.25	12.25	14.00
Coke, Connellsville, Per Net Ton at Oven:				
Furnace coke, prompt	$2.60	$2.60	$2.60	$2.85
Foundry coke, prompt	3.50	3.50	3.50	3.75
Metals, *Per Lb. to Large Buyers:*	Cents	Cents	Cents	Cents
Lake copper, New York	18.12½	18.12½	18.12½	24.12½
Electrolytic copper, refinery	17.75	17.75	17.75	23.75
Tin (Straits), New York	*36.75*	37.87½	37.00	48.50
Zinc, East St. Louis	*4.82½*	4.85	5.10	6.80
Zinc, New York	*5.17½*	5.20	5.45	7.15
Lead, St. Louis	5.00	5.55	5.85	7.65
Lead, New York	5.75	5.65	6.00	7.75
Antimony (Asiatic), N. Y.	8.00	7.87½	9.00	9.62½

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

Pittsburgh

Price Weakness More Pronounced But Steel Tonnage Shows Slight Gains—Pipe Reduced $4 a Ton

PITTSBURGH, April 1.—The beginning of the second quarter finds the Pittsburgh district steel industry in a state of uncertainty, but with sentiment considerably better than it was a month ago. Steel producers are glad to see the first quarter pass into history. Although the first three months of the year were by no means completely disastrous from the standpoint of profits, an average operating rate of not more than 75 per cent of capacity, coupled with a chaotic price condition, left much to be desired.

The new quarter promises no improvement in shipping prices, but a steadier and more diversified demand will undoubtedly pave the way for more satisfactory conditions in the last half of the year. Under such circumstances, conservative opinion in this district will be more than satisfied if the next three months bring stability to business conditions, and not a sudden and unexpected acceleration in demand for steel products.

The larger steel consuming industries enter the spring months under fairly satisfactory circumstances. Automobile production for April, as indicated by early releases of steel products, will be considerably higher than in March. The two leading makers of cars in the medium price class have released shipments of increased tonnages of sheets, strip and bars.

Railroad equipment builders served by Pittsburgh mills are taking shipments in fair volume, but seem inclined to extend execution of present car orders over as long a period as possible. The local rail mill is running at capacity, and releases on track accessories have improved materially in the last few days.

Inquiries for pipe for the larger oil and gas companies continue to pile up, and considerable of such tonnage has already been placed in the West. Impressive demand for line pipe is expected to offset to some extent the disappointing prospect for oil country goods and the restricted demand for standard pipe which has been experienced thus far in the year. Standard pipe, along with other steel products going to the building industry, is quiet at present.

Building operations are expanding with the coming of warm weather and heavier demand for structural steel, reinforcing bars and sheet metal products is beginning to develop.

Steel ingot production in the Pittsburgh district is holding at about 75 per cent of capacity, and expanded output is reported from the Valleys. The general average for finishing mills is probably about five points lower, although tin plate output has passed the 85 per cent mark, and sheet and strip mills are running this week at a better rate.

A reduction of $4 a ton in quotations on pipe, announced as effective April 1 by the leading producer, is the outstanding development of the week from the standpoint of prices. Pipe discounts had not been changed materially since the advance of April, 1923. Serious price weakness continues on many other steel items. Hot-rolled strip has been sold in large tonnages at $2 under the recent quotations of 1.80c. and 1.90c., Pittsburgh, and shading of the 2.65c., Pittsburgh, price on black sheets seems more wide-

spread. Plates and shapes are holding in the Pittsburgh district at 1.80c., but large contracts have been reported placed in the East at sharp concessions. Sales of bars have been made freely at 1.80c., although the majority of smaller users are under contract at 1.85c. Semi-finished steel remains nominal at $33, Pittsburgh or Youngstown, with little forward buying. Shipments of wire nails at prices considerably under the quoted market will continue to be made until April 10, after which the $2.30, Pittsburgh, quotation is expected to hold. No variations from 2.40c., Pittsburgh, on manufacturers' wire are reported in this district.

Semi-Finished Steel.—A few sellers of semi-finished steel have made second quarter contracts with some of their regular customers, but many consumers still have material coming to them on their first quarter allotments and have no need to sign additional contracts at this time. Shipments were rather light during March, as the operations of the smaller companies which are forced to buy their crude steel have been more seriously affected by light demand than those of the larger integrated mills.

Prices of billets, slabs and sheet bars are still nominally quotable at $33, Pittsburgh or Youngstown. Users of forging billets have generally signed their second quarter contracts at $38, Pittsburgh, and are taking shipments at a fair rate. Wire rods are moving about as they have for several weeks, and second quarter contracts have generally commanded $38, Pittsburgh.

Bars, Shapes and Plates.—Specifications during March showed little improvement over January and February, and were somewhat lighter than in January with some producers. However, the last two weeks of the month have seen the development of a better tone in the market. While tonnage releases have shown no large increase, they seem definitely to have passed the low point. Railroad car builders are specifying steadily, and, although the volume might seem rather light in view of their comparatively heavy order books, the carriers are in no hurry for deliveries of rolling stock, and car builders are well satisfied to extend their business over as long a period as possible. Plate business in general is quiet, but rather steady, and production is going directly into consumption.

Reduction of $4 a ton on pipe announced.

* * *

Plates, shapes and bars irregular; bars 1.80c. on larger sales.

* * *

Reinforcing bars decline $2 a ton to 1.85c., Pittsburgh.

* * *

Nail prices dip to $2.15 and $2.20 in final week of first quarter.

* * *

April automobile production will show gains; makers placing heavier sheet orders.

* * *

Building operations expanding, with larger demands for building steel products.

Structural awards in this district are light, but Pittsburgh mills are benefiting from tonnage placed in other parts of the country, and the larger fabricators are no longer reducing their backlogs materially. Smaller fabricating shops are badly in need of business, but will soon benefit by numerous small jobs which commonly appear with warmer weather.

Demand for bars has been slightly better in the last week or two, apparently because of the April requirements of the automobile industry, which generally call for increased tonnage. Reinforcing bars are more active, but the large tonnages before the trade are being placed rather slowly. Considerable road and bridge work is pending in the immediate Pittsburgh vicinity, which might be awarded this month.

Pittsburgh mills are now quoting billet steel reinforcing bars in 40, 50 and 60-ft. lengths at 1.85c., a decline of $2 a ton from recent levels. Prices on soft steel bars are being held on the majority of orders at 1.85c., Pittsburgh, though 1.80c. is more common for shipment to some districts. Plates and shapes are more irregular, with quotations ranging from 1.80c. to 1.85c., Pittsburgh, and 1.75c. being done in occasional instances.

Pig Iron.—Business shows no improvement, with the usual number of small-lot orders being placed from day to day. The beginning of the second quarter brought no perceptible change in new tonnage, as most consumers are continuing their practice of buying only to cover actual needs. The Elliott Co., Jeannette, Pa., has closed against its recent inquiry for a few hundred tons of foundry iron. Shipments are steady at recent levels, but merchant furnaces, with one possible exception, all made more iron during March than they shipped.

Prices are unchanged, the present levels of $18.50, Valley, for foundry and basic iron, and $19 for malleable and Bessemer, having been in effect now for one year. This probably sets a record for stability in Valley pig iron quotations. On foundry, malleable and Bessemer iron these figures are being tested from day to day, but no large sales of basic iron have been reported for several weeks.

The Davison Coke & Iron Co. blew in its Neville Island, Pittsburgh, furnace on March 31, and will take out its Sharpsville stack this week.

Prices per gross ton, f.o.b. Valley furnace:

Basic	$18.50
Bessemer	19.00
Gray forge	18.00
No. 2 foundry	18.50
No. 3 foundry	18.00
Malleable	19.00
Low phos., copper free	27.00

Freight rate to Pittsburgh or Cleveland district, $1.76.

Prices per gross ton, f.o.b. Pittsburgh district furnace:

Basic	$19.00
No. 2 foundry	19.00
No. 3 foundry	18.50
Malleable	19.50

Freight rates to points in Pittsburgh district range from 63c. to $1.13.

Rail and Track Supplies.—Specifications continue to improve, and March business was considered satisfactory with most makers. Mills are running at a fair rate and in the last few days several roads, which had been doing nothing since the first of the year, have begun to order out supplies.

The Iron Age Composite Prices

Finished Steel

April 1, 1930, 2.264c. a Lb.

One week ago	2.312c.
One month ago	2.312c.
One year ago	2.412c.

Based on steel bars, beams, tank plates, wire, rails, black pipe and black sheets. These products make 87 per cent of the United States output of finished steel.

	High	Low
1930	2.362c., Jan. 7;	2.264c., April 1
1929	2.412c., April 2;	2.362c., Oct. 29
1928	2.391c., Dec. 11;	2.314c., Jan. 3
1927	2.453c., Jan. 4;	2.293c., Oct. 25
1926	2.453c., Jan. 5;	2.403c., May 18
1925	2.560c., Jan. 6;	2.396c., Aug. 18

Pig Iron

April 1, 1930, $17.75 a Gross Ton

One week ago	$17.75
One month ago	17.75
One year ago	18.46

Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

	High	Low
1930	$18.21, Jan. 7;	$17.75, March 4
1929	18.71, May 14;	18.21, Dec. 17
1928	18.59, Nov. 27;	17.04, July 24
1927	19.71, Jan. 4;	17.54, Nov. 1
1926	21.54, Jan. 5;	19.46, July 13
1925	22.50, Jan. 13;	18.96, July 7

Mill Prices of Finished Iron and Steel Products

Iron and Steel Bars

Soft Steel

	Base per Lb.
F.o.b. Pittsburgh mill	1.80c. to 1.85c.
F.o.b. Chicago	1.95c. to 2.00c.
Del'd Philadelphia	2.12c. to 2.17c.
Del'd New York	2.14c. to 2.19c.
Del'd Cleveland	1.85c.
F.o.b. Cleveland	1.85c.
F.o.b. Lackawanna	1.90c. to 2.00c.
F.o.b. Birmingham	2.00c.
C.i.f. Pacific ports	2.35c.
F.o.b. San Francisco mills	2.35c.

Billet Steel Reinforcing

F.o.b. Pittsburgh mills, 40, 50, 60-ft.	1.85c.
F.o.b. Pittsburgh mills, cut lengths	2.20c.
F.o.b. Birmingham, mill lengths	2.00c.

Rail Steel

F.o.b. mills, east of Chicago dist.	1.80c. to 1.90c.
F.o.b. Chicago Heights mill	1.85c.
Del'd Philadelphia	2.12c. to 2.22c.

Iron

Common iron, f.o.b. Chicago	1.95c. to 2.00c.
Refined iron, f.o.b. P'gh mills	2.75c.
Common iron, del'd Philadelphia	2.12c.
Common iron, del'd New York	2.14c.

Tank Plates

	Base per Lb.
F.o.b. Pittsburgh mill	1.80c. to 1.85c.
F.o.b. Chicago	1.90c. to 2.00c.
F.o.b. Birmingham	2.00c.
Del'd Cleveland	1.99c. to 2.04c.
Del'd Philadelphia	1.95c. to 2.00c.
F.o.b. Coatesville	1.85c. to 1.90c.
F.o.b. Sparrows Point	1.90c. to 1.95c.
F.o.b. Lackawanna	1.90c. to 1.95c.
Del'd New York	2.07½c. to 2.12½c.
C.i.f. Pacific ports	2.20c.

Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh mill	1.80c. to 1.85c.
F.o.b. Chicago	1.90c. to 2.00c.
F.o.b. Birmingham	2.00c.
F.o.b. Lackawanna	1.90c. to 1.95c.
F.o.b. Bethlehem	1.90c. to 1.95c.
Del'd Cleveland	2.04c.
Del'd Philadelphia	1.81c. to 1.86c.
Del'd New York	2.04½c. to 2.09½c.
C.i.f. Pacific Ports	2.35c.

Hot-Rolled Hoops, Bands and Strips

	Base per Lb.
6 in. and narrower, P'gh	1.80c. to 1.90c.
Wider than 6 in., P'gh	1.70c. to 1.80c.
6 in. and narrower, Chicago	1.95c. to 2.00c.
Wider than 6 in., Chicago	1.85c. to 1.90c.
Cooperage stock, P'gh	2.10c. to 2.20c.
Cooperage stock, Chicago	2.30c.

Cold-Finished Steel

	Base per Lb.
Bars, f.o.b. Pittsburgh mill	2.10c.
Bars, f.o.b. Chicago	2.10c.
Bars, Cleveland	2.10c.
Bars, Buffalo	2.10c.
Shafting, ground, f.o.b. mill	*2.45c. to 3.40c.
Strips, P'gh	2.55c. to 2.65c.
Strips, Cleveland	2.55c. to 2.65c.
Strips, del'd Chicago	2.85c. to 2.95c.
Strips, Worcester	2.80c. to 2.90c.
Fender stock, No. 20 gage, Pittsburgh or Cleveland	3.90c.

*According to size.

Wire Products

(Carload lots, f.o.b. Pittsburgh and Cleveland.)

To Merchant Trade

	Base per Keg
Standard wire nails	$2.20 to $2.30
Cement coated nails	2.30
Galvanized nails	4.30
	Base per Lb.
Polished staples	2.75c.
Galvanized staples	3.00c.
Barbed wire, galvanized	2.95c.
Annealed fence wire	2.45c.
Galvanized wire, No. 9	2.90c.
Woven wire fence (per net ton to retailers)	$65.00

To Manufacturing Trade

Bright hard wire, Nos. 6 to 9 gage	2.40c.
Spring wire	3.50c.

(Carload lots, f.o.b. Chicago)

Wire nails	$2.35 to $2.45 (keg)
Annealed fence wire	2.50c. to 2.60c. (lb.)
Bright hard wire to manufacturing trade	2.45c.

Anderson, Ind., mill prices are ordinarily $1 a ton over Pittsburgh base; Duluth, Minn., mill $2 a ton over Pittsburgh, and Birmingham mill $3 a ton over Pittsburgh.

Cut Nails

	Per 100 Lb.
Carloads, Wheeling, Reading or Northumberland, Pa.	$2.55 to $2.60
Less carloads, Wheeling or Reading	2.70

Light Plates

No. 10, blue annealed, f.o.b. P'gh	2.10c.
No. 10, blue annealed, f.o.b. Chicago dist.	2.20c.
No. 10, blue annealed, del'd Phila.	2.42c.
No. 10, blue annealed, B'ham	2.25c.

Sheets

Blue Annealed

	Base per Lb.
No. 13, f.o.b. P'gh	2.25c.
No. 13, f.o.b. Chicago dist.	2.35c.
No. 13, del'd Philadelphia	2.57c.
No. 13, blue annealed, B'ham	2.50c.

Continuous Mill Sheets

No. 10 gage, f.o.b. P'gh	1.80c. to 1.90c.
No. 13 gage, f.o.b. P'gh	1.95c. to 2.05c.

(Usual range 24 in. to 48 in. wide.)

Box Annealed, One Pass Cold Rolled

No. 24, f.o.b. Pittsburgh	2.55c. to 2.65c.
No. 24, f.o.b. Chicago dist. mill	2.65c. to 2.75c.
No. 24, del'd Philadelphia	2.97c.
No. 24, f.o.b. Birmingham	2.90c.

Metal Furniture Sheets

No. 24, f.o.b. P'gh	3.90c.

Galvanized

No. 24, f.o.b. Pittsburgh	3.30c.
No. 24, f.o.b. Chicago dist. mill	3.40c.
No. 24, del'd Cleveland	3.49c.
No. 24, del'd Philadelphia	3.62c.
No. 24, f.o.b. Birmingham	3.45c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh	2.80c. to 2.90c.
No. 28, f.o.b. Chicago dist. mill	3.00c. to 3.10c.

Automobile Body Sheets

No. 20, f.o.b. Pittsburgh	3.80c.

Long Ternes

No. 24, 8-lb. coating, f.o.b. mill	3.90c. to 4.00c.

Vitreous Enameling Stock

No. 24, f.o.b. Pittsburgh	3.90c.

Tin Plate

	Per Base Box
Standard cokes, f.o.b. P'gh district mills	$5.25
Standard cokes, f.o.b. Gary	5.35

Terne Plate

(F.o.b. Morgantown or Pittsburgh)

(Per Package, 20 x 28 in.)

8-lb. coating I.C.	$10.70
15-lb. coating I.C.	13.40
20-lb. coating I.C.	14.60
25-lb. coating I.C.	$15.90
30-lb. coating I.C.	16.80
40-lb. coating I.C.	18.80

Alloy Steel Bars

(F.o.b. makers' mill)

Alloy Quantity Bar Base, 2.65c. per Lb.

S.A.E. Series Numbers		Alloy Differential
2000	(1¼% Nickel)	$0.25
2100	(1½% Nickel)	0.55
2300	(3½% Nickel)	1.50
2500	(5% Nickel)	2.25
3100	Nickel Chromium	0.55
3200	Nickel Chromium	1.35
3300	Nickel Chromium	3.80
3400	Nickel Chromium	3.20
4100	Chromium Molybdenum (0.15 to 0.25 Molybdenum)	0.50
4100	Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600	Nickel Molybdenum (0.20 to 0.30 Molybdenum, 1.25 to 1.75 Nickel)	1.05
5100	Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100	Chromium Steel (0.80 to 1.10 Chromium)	0.45
5100	Chromium Spring Steel	0.20
6100	Chromium Vanadium Bars	1.20
6100	Chromium Vanadium Spring Steel	0.95
9250	Silicon Manganese Spring Steel (flats)	0.25
	Rounds and squares	0.50
	Chromium Nickel Vanadium	1.50
	Carbon Vanadium	0.95

Above prices are for hot rolled steel bars, forging quality. The differential for cold-drawn bars is ¾c. a lb. higher, with standard classification for cold-finished alloy steel bars applying. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis.

Billets under 4 x 4 in. carry the steel bar base. Slabs with a sectional area of 16 in. or over carry the billet price. Slabs with sectional area of less than 16 in. or less than 2¼ in. thick, regardless of sectional area, take the bar price.

Rails

	Per Gross Ton
Standard, f.o.b. mill	$43.00
Light (from billets), f.o.b. mill	36.00
Light (from rail steel), f.o.b. mill	34.00
Light (from billets), f.o.b. Ch'go mill	36.00

Track Equipment

	Base per 100 Lb.
Spikes, ⅜ in. and larger	$2.80
Spikes, ⅓ in. and smaller	2.80
Spikes, boat and barge	3.00
Tie plate, steel	2.07½
Angle bars	$2.75
Track bolts, to steam railroads	$3.80 to 4.00
Track bolts, to jobbers, all sizes, per 100 count	70 per cent off list

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Butt Weld

Steel Inches	Black	Galv.	*Iron* Inches	Black	Galv.
⅛	47	21½	¼ and ⅜	+11	+36
¼ to ⅜	58	27½	½	23	6
½	58	44½	¾	28	11
¾	62	50½	1 and 1¼	31	15
1 to 3	64	52½	1½ and 2	35	18

Lap Weld

2	57	45½	2	23	9
2½ to 6	61	49½	2½ to 3½	28	13
7 and 8	58	45½	4 to 6	30	17
9 and 10	56	43½	7 and 8	29	16
11 and 12	55	42½	9 to 12	26	11

Butt Weld, extra strong, plain ends

⅛	43	26½	¼ and ⅜	+13	+48
¼ to ⅜	49	32½	½	23	7
½	55	44½	¾	28	12
¾	60	49½	1 to 2	34	18
1 to 1½	62	51½			
2 to 3	63	52½			

Lap Weld, extra strong, plain ends

2	55	44½	2	29	13
2½ to 4	59	48½	2½ to 4	34	20
4½ to 6	58	47½	4½ to 6	33	19
7 to 8	54	41½	7 and 8	31	17
9 and 10	47	34½	9 to 12	21	8
11 and 12	46	33½			

On carloads the above discounts on steel pipe are increased on black by one point, with supplementary discount of 5%, and on galvanized by 1½ points, with supplementary discount of 5%. On iron pipe, both black and galvanized, the above discounts are increased to jobbers by one point with supplementary discounts of 5 and 2½%.

Note.—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel		*Charcoal Iron*	
2 in. and 2¼ in.	38	1½ in.	1
2½ in.—2¾ in.	46	1¾ in.	8
3 in.	52	2 in.—2¼ in.	13
3¼ in.—3¾ in.	54	2½ in.—2¾ in.	16
4 in.	57	3 in.	17
4½ in. to 6 in.	46	3¼ in. to 3½ in.	18
		4 in.	20
		4½ in.	21

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap Welded Steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload, 4 points under base and two fives. Charcoal Iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five.

Standard Commercial Seamless Boiler Tubes

Cold Drawn

1 in.	61	3 in.	46
1¼ to 1½ in.	53	3½ to 3½ in.	48
1¾ in.	37	4 in.	51
2 to 2¼ in.	32	4½, 5 and 6 in.	40
2½ to 2¾ in.	40		

Hot Rolled

2 and 2¼ in.	38	3¼ to 3½ in.	54
2½ and 2¾ in.	46	4 in.	57
3 in.	52	4½, 5 and 6 in.	46

Beyond the above base discounts a preferential discount of 5 per cent is allowed on carload lots. On less than carloads to 10,000 lb., base discounts are reduced 4 points with 5 per cent preferential; on less than 10,000 lb., base discounts are reduced 6 points, with no preferential. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. and lighter than standard gages take the mechanical tube list and discounts. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

Seamless Mechanical Tubing

	Per Cent Off List
Carbon, 0.10% to 0.30% base (carloads)	55
Carbon, 0.30% to 0.40% base	50

Plus differentials for lengths over 12 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.

Tubular Goods.—Prices on black and galvanized steel pipe have been reduced $4 a ton, the first important price change in seven years. The reductions apply to both lap-weld and butt-weld pipe in both extra and double extra strong material, and also to oil line pipe. Similar declines will be effective on other oil well supplies. This reduction, which has been announced by the leading producer, will be followed by other makers.

Business has shown little improvement, and even standard pipe has failed to reflect any of the substantial gains which might be expected at this time of the year. This is attributed to light building operations in nearly all parts of the country.

The Montana-Dakota Power Co., Minneapolis, has closed on 276 miles of 12-in. pipe for two gas lines in Montana and North Dakota, which will require about 24,000 tons of pipe. This business is reported to have been placed with a Milwaukee maker. Neither the Sun Oil Co. nor the Barnsdale Corporation has closed against recent inquiries for their 6-in. gasoline carrying pipe lines, although this tonnage will undoubtedly be placed this month. Action is also expected on the gas line for the Doherty interests, running from the Texas Panhandle into Chicago.

Sheets.—The past week has been a satisfactory one from the standpoint of orders placed, although specifications on old orders have not been equally impressive. A number of automobile manufacturers are placing heavier tonnages for April delivery than they did for March, but dull business in the Detroit area is still responsible for most of the present woes of the sheet industry. One large producer indicates that its March business would have substantiated a capacity operation if the automobile industry had been running at a normal rate. The actual rate of this mill during March did not average much over 70 per cent. Valley mills are running at a better rate this week, but demand is not well enough diversified to make the improvement general. Makers of building products, notably metal lath, are increasing their requirements steadily, and stove makers are again an important factor in the market. Electric refrigerator makers are preparing for summer demand, and other industries which have been quiet for the last three months are reflecting the usual spring expansion.

Prices show mixed trends. Galvanized sheets are comparatively strong at 3.30c., Pittsburgh, and reports of shading in the East cannot be substantiated in this district. The Detroit territory continues to reflect weakness, although automobile body sheets seem to be well established at 3.80c., following the recent $2 a ton decline. Material is still being sold on a black sheet base in the Detroit district at 2.55c., Pittsburgh, but invariably calls for heavy extras, which compensate in part for the lower base price.

Strip Steel.—Business continues to reflect the improvement reported in the last week or two, but the price structure is adversely affecting forward buying, particularly on hot-rolled material. Specifications last week were equal to the best week of February and, if the improvement continues, April will certainly prove to be the best month since November. Automotive buying is still restricted, but in tonnage rather than specifications, as all makers are showing interest in their raw material requirements. Operations this week average about 60 per cent of capacity on hot-rolled material and 35 to 40 per cent on cold-rolled.

The price on the latter is unchanged at 2.55c. to 2.65c., Pittsburgh. Hot-rolled strip prices are less clearly defined and, with business being taken at 1.70c. to 1.80c. for wide material and 1.80c. to 1.90c. for the narrow, the market seems to be dragging bottom. Some tonnage is going at 1.75c. and 1.85c., the extreme prices being applicable to only a few large buyers. The higher quotations apply principally to small lots.

Wire Products.—The daily rate of wire shipments in March was slightly less than in February with some companies, but specifications have been moderately heavier in the last two weeks, and April promises to show improvement.

Coke.—Furnace coke prices are soft, but not quotably lower than $2.60, Connellsville. Foundry coke continues quiet, and, with second quarter contracting largely completed, shipments are continuing at about the same rate which has prevailed for several weeks.

Warehouse Business.—Sales of iron and steel products out of warehouse registered improvement in March as compared with the two previous months. In the last two weeks galvanized sheets and corrugated material have been more active. Light plate and blue annealed sheet prices have been reduced, and are now quoted at 3.20c. and 3.25c. for the No. 10 and No. 13 gage respectively in lots of 400 lb. to 3999 lb. on sheets and on less than 25 plates. Bolt prices are being shaded in some cases by the granting of an extra 10 per cent over the regular 60 per cent discount.

Pittsburgh warehouses have adopted quantity differentials on heavy hot-rolled products, bands, hoops and blue annealed sheets. These provide for an extra charge of 50c. per 100 lb. on all orders for less than 400 lb., while the base price applies on orders of 400 to 3999 lb. Orders for 4000 to 7999 lb. take a differential of 15c. per 100 lb.; 8000 lb. to 14,999 lb., a differential of 25c., and 15,000 lb. and over, of 35c.

Old Material.—The scrap market is exceedingly inactive. No mill purchases have been reported for at least two weeks, and, with shipments to at least two large consuming points being made entirely from dealers' yards, little material is being bought in the open market to cover old sales. Under the circumstances, prices on the principal open-hearth grades of scrap remain quotable nominally at the levels which prevailed last week.

The closing of the Pennsylvania Railroad list on April 2 will clarify the price situation to a considerable extent, and the price paid is likely to be slightly lower than that of a month ago. The Baltimore & Ohio list, which closes April 7, contains 11,000 tons of scrap.

Specialties are weaker, with $20.50 representing the top of the market. Dealers are experiencing some difficulty in disposing of this material at prices considerably less.

Warehouse Prices, f.o.b. Pittsburgh

	*Base per Lb.
Plates	3.00c.
Structural shapes	3.00c.
Soft steel bars and small shapes	2.90c.
Reinforcing steel bars	2.90c.
Cold-finished and screw stock—	
Rounds and hexagons	3.60c.
Squares and flats	4.10c.
Bands	3.25c.
Hoops	4.25c.
Black sheets (No. 24), 25 or more bundles	3.60c.
Galv. sheets (No. 24), 25 or more bundles	4.25c.
Light plates, blue annealed (No. 10), 1 to 24 plates	3.20c.
Blue annealed sheets (No. 13)	3.25c.
Galv. corrug. sheets (No. 28), per square	4.13c.
Spikes, large	3.40c.
Small	3.80c. to 5.25c.
Boat	3.80c.
Track bolts, all sizes, per 100 count,	60 per cent off list
Machine bolts, 100 count,	60 per cent off list
Carriage bolts, 100 count,	60 per cent off list
Nuts, all styles, 100 count,	60 per cent off list
Large rivets, base per 100 lb.	$3.50
Wire, black, soft ann'l'd, base per 100 lb	$2.75 to 2.85
Wire, galv. soft, base per 100 lb.	3.20 to 3.30
Common wire nails, per keg	2.60 to 2.75
Cement coated nails, per keg	2.65 to 2.80

*On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applies on orders of 400 to 3999 lb.

Prices per gross ton delivered consumers' yards in Pittsburgh and points taking the Pittsburgh district freight rate:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$16.00 to $16.50
No. 2 heavy melting steel	14.00 to 14.50
Scrap rails	15.00 to 15.50
Compressed sheet steel	15.50 to 16.00
Bundled sheets, sides and ends	14.00 to 14.50
Cast iron carwheels	14.50 to 15.00
Sheet bar crops, ordinary	18.00 to 18.50
Heavy breakable cast	12.00 to 12.50
No. 2 railroad wrought	16.00 to 16.50
Hvy. steel axle turnings	13.75 to 14.25
Machine shop turnings	10.75 to 11.25
Acid Open-Hearth Grades:	
Railr. knuckles and couplers	20.00 to 20.50
Railr. coil and leaf springs	20.00 to 20.50
Rolled steel wheels	20.00 to 20.50
Low phos. billet and bloom ends	21.50 to 22.50
Low phos. mill plates	20.50 to 21.50
Low phos. light grades	20.50 to 21.50
Low phos. sheet bar crops	21.00 to 22.00
Heavy steel axle turnings	13.75 to 14.25
Electric Furnace Grades:	
Low phos. punchings	19.50 to 20.00
Hvy. steel axle turnings	13.75 to 14.25
Blast Furnace Grades:	
Short shoveling steel turnings	10.75 to 11.25
Short mixed borings and turnings	10.75 to 11.25
Cast iron borings	10.75 to 11.25
Rolling Mill Grades:	
Steel car axles	20.50 to 21.50
Cupola Grades:	
No. 1 cast	14.00 to 15.00
Rails 3 ft. and under	18.50 to 19.50

Semi-Finished Steel, Raw Materials, Bolts and Rivets

Mill Prices of Semi-Finished Steel

Billets and Blooms

	Per Gross Ton
Rerolling, 4-in. and under 10-in. Pittsburgh	$33.00
Rerolling, 4-in. and under 10-in., Youngstown	33.00
Rerolling, 4-in. and under 10-in., Cleveland	33.00
Rerolling, 4-in. and under 10-in., Chicago.	34.00
Forging quality, Pittsburgh	38.00

Sheet Bars

(Open Hearth or Bessemer)

	Per Gross Ton
Pittsburgh	$33.00
Youngstown	33.00
Cleveland	33.00

Slabs

(8 in. x 2 in. and under 10 in. x 10 in.)

	Per Gross Ton
Pittsburgh	$33.00
Youngstown	33.00
Cleveland	33.00

Skelp

(F.o.b. Pittsburgh or Youngstown)

	Per Lb.
Grooved	1.85c. to 1.90.c
Universal	1.85c. to 1.90c.
Sheared	1.85c. to 1.90c.

Wire Rods

(Common soft, base)

	Per Gross Ton
Pittsburgh	$38.00
Cleveland	38.00
Chicago	39.00

Prices of Raw Material

Ores

Lake Superior Ores, Delivered Lower Lake Ports

	Per Gross Ton
Old range Bessemer, 51.50% iron	$4.80
Old range non-Bessemer, 51.50% iron	4.65
Mesabi Bessemer, 51.50% iron	4.65
Mesabi non-Bessemer, 51.50% iron	4.50
High phosphorus, 51.50% iron	4.40

Foreign Ore, c.i.f. Philadelphia or Baltimore

	Per Unit
Iron ore, low phos., copper free, 55 to 58% iron in dry Spanish or Algerian	12.00c.
Iron ore, low phos., Swedish, average 68% iron	12.00c.
Iron ore, basic Swedish, average 65% iron	10.00c.
Manganese ore, washed 52% manganese, from the Caucasus	30.00c.
Manganese ore, Brazilian, African or Indian, basic 50%	30.00c.
Tungsten ore, high grade, per unit, in 60% concentrates	$14.50 to $15.50

	Per Gross Ton
Chrome ore, 45 to 50% Cr_2O_3, crude, c.i.f. Atlantic seaboard	$22.00 to $24.00

	Per Lb.
Molybdenum ore, 85% concentrates of MoS_2, delivered	50c. to 55c.

Coke

	Per Net Ton
Furnace f.o.b. Connellsville prompt	$2.60
Foundry, f.o.b. Connellsville prompt	$3.50 to 4.75
Foundry, by-product, Ch'go ovens	8.00
Foundry, by-product, New England, del'd	11.00
Foundry, by-product, Newark or Jersey City, delivered	9.00 to 9.40
Foundry, by-product, Phila.	9.00
Foundry, Birmingham	5.00
Foundry, by-product, St. Louis, f.o.b. ovens	8.00
Foundry by-prod., del'd St. Louis	9.00

Coal

	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	$1.25 to $1.75
Mine run coking coal, f.o.b. W. Pa. mines	1.50 to 1.75
Gas coal, ¾-in. f.o.b. Pa. mines	1.90 to 2.00
Mine run gas coal, f.o.b. Pa. mines	1.65 to 1.75
Steam slack, f.o.b. W. Pa. mines	80c. to 90c.
Gas slack, f.o.b. W. Pa. mines	1.00 to 1.10

Ferromanganese

	Per Gross Ton
Domestic, 80%, seaboard	$94.00 to $99.00
Foreign, 80%, Atlantic or Gulf port, duty paid	94.00 to 99.00

Spiegeleisen

	Per Gross Ton Furnace
Domestic, 19 to 21%	$31.00 to $34.00
Domestic, 16 to 19%	29.00 to 32.00

Electric Ferrosilicon

	Per Gross Ton Delivered
50%	$83.50
75%	130.00

	Per Gross Ton Furnace		Per Gross Ton Furnace
10%	$35.00	12%	$39.00
11%	37.00	14 to 16%	45.00

Bessemer Ferrosilicon

F.o.b. Jackson County, Ohio, Furnace

	Per Gross Ton		Per Gross Ton
10%	$30.00	12%	$34.00
11%	32.00		

Silvery Iron

F.o.b. Jackson County, Ohio, Furnace

	Per Gross Ton		Per Gross Ton
6%	$22.00 to $23.00	10%	$26.00 to $28.00
7%	23.00 to 24.00	11%	28.00 to 30.00
8%	24.00 to 25.00	12%	30.00 to 32.00
9%	25.00 to 26.00		

Other Ferroalloys

Ferrotungsten, per lb. contained metal del'd	$1.40 to $1.50
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads	11.00c.
Ferrovanadium, per lb. contained vanadium, f.o.b. furnace	$3.15 to $3.65
Ferrocarbontitanium, 15 to 18%, per net ton, f.o.b. furnace, in carloads	$160.00
Ferrophosphorus, electric or blast furnace material, in carloads, 18%, Rockdale, Tenn., base, per gross ton	$91.00
Ferrophosphorus, electric 24%, f.o.b. Anniston, Ala., per gross ton	$122.50

Fluxes and Refractories

Fluorspar

	Per Net Ton
Domestic, 85% and over calcium fluoride, not over 5% silicon, gravel, f.o.b. Illinois and Kentucky mines	$18.00
No. 2 lump, Illinois and Kentucky mines	20.00
Foreign, 85% calcium fluoride, not over 5% silica, c.i.f. Atlantic port, duty paid	$18.00 to 18.50
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silica, f.o.b. Illinois and Kentucky mines	32.50

Fire Clay Brick

	Per 1000 f.o.b. Works	
	High-Heat Duty Brick	Intermediate Heavy Duty Brick
Pennsylvania	$43.00 to $46.00	$35.00 to $38.00
Maryland	43.00 to 46.00	35.00 to 38.00
New Jersey	50.00 to 65.00	.....
Ohio	43.00 to 46.00	35.00 to 38.00
Kentucky	43.00 to 46.00	35.00 to 38.00
Missouri	43.00 to 46.00	35.00 to 38.00
Illinois	43.00 to 46.00	35.00 to 38.00
Ground fire clay, per ton	7.00	

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	$43.00
Chicago	52.00
Birmingham	50.00
Silica clay, per ton	$8.50 to 10.00

Magnesite Brick

	Per Net Ton
Standard sizes, f.o.b. Baltimore and Chester, Pa.	$65.00
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	40.00
Standard size	45.00

Chrome Brick

	Per Net Ton
Standard size	$45.00

Mill Prices of Bolts, Nuts, Rivets and Set Screws

Bolts and Nuts

Per 100 Pieces

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
†Machine bolts	70
†Carriage bolts	70
Lag bolts	70
Plow bolts, Nos. 1, 2, 3 and 7 heads	70
Hot-pressed nuts, blank or tapped, square	70
Hot-pressed nuts, blank or tapped, hexagons	70
C.p.c. and t. square or hex. nuts, blank or tapped	70
Washers*	7.00c. to 6.75c. per lb. off list

*F.o.b. Chicago, New York and Pittsburgh.

†Bolts with rolled thread up to and including ⅛ in. x 6 in. take 10 per cent lower list prices.

Bolts and Nuts

	Per Cent Off List
Semi-finished hexagon nuts	70
Semi-finished hexagon castellated nuts, S.A.E.	70
Stove bolts in packages, P'gh	75, 20, 10 and 5
Stove bolts in packages, Chicago	75, 20, 10 and 5
Stove bolts in packages, Cleveland	75, 20, 10 and 5
Stove bolts in bulk, P'gh	75, 20, 10, 5 and 2½
Stove bolts in bulk, Chicago	75, 20, 10, 5 and 2½
Stove bolts in bulk, Cleveland	75, 20, 10, 5 and 2½
Tire bolts	60, 5 and 5

Discounts of 70 per cent off on bolts and nuts applied on carload business. For less than carload orders discounts of 55, 60 per cent apply.

Large Rivets

(½-in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh or Cleveland	$3.10
F.o.b. Chicago	3.20

Small Rivets

(⅞-in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh	70 and 10
F.o.b. Cleveland	70 and 10
F.o.b. Chicago	70 and 10

Cap and Set Screws

(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)

	Per Cent Off List
Mille[d] cap screws	80, 10 and 5
Milled standard set screws, case hardened,	80 and 5
Milled headless set screws, cut thread	75 and 10
Upset hex. head cap screws, U.S.S. thread,	85 and 10
Upset hex. cap screws, S.A.E. thread	85 and 10
Upset set screws	80, 10 and 5
Milled studs	70

Chicago

Pipe Lines Contribute to Further Gains in Steel Business—Specifications Heaviest This Year

CHICAGO, April 1.—The tone of the Chicago iron and steel market continues to improve. New buying in finished steel products, though still at rather close range, is the largest in several weeks. Specifications mark this as one of the best weeks so far this year. The tonnage being sought and that being taken from week to week is well diversified, notwithstanding that in recent days plates for pipe line manufacture are an outstanding factor.

A large tonnage of plates will be shipped over the next seven weeks for pipe line contracts that are now under way, and inquiries for similar work are promising. The pipe plant at Milwaukee is adding to its force and is operating on three shifts.

Interest is reviving in the railroad car market. Several Eastern roads are reported as being near the point of making large inquiries, and several Western railroads, including the Illinois Central, are ready to make known their needs. Repairs for tank cars will bring 1500 tons of plates into this market. Of 91 passenger cars ordered by the Van Sweringen roads, it is estimated that 53 will be built in Western shops.

The price structure remains much as it was a week ago, except for reported weakness in quotations on wire, common nails and a $2 a ton reduction on black sheets.

Inquiries for structural shapes, though individually small, show improvement in numbers, and there are indications that heavy tonnages may soon come into this market.

The melt of pig iron grows slowly, shipments in March having led those in February by a comfortable margin. As viewed by current releases and more active buying for second quarter, sellers believe that they have reason to anticipate a higher rate of delivery in April.

Mill operations and deliveries of steel commodities are again functioning normally after a heavy blizzard which early in the week seriously handicapped the producers and the railroads.

Sheets.—Unsteadiness in prices is again making itself felt in this market. New business is scattered and at close range, with the result that competition between Chicago mills and producers in the East is keen. Quotations on blue annealed sheets lack strength, while sales of black sheets are being made locally at prices which are off $2 a ton.

Lack of backlogs and the scanty amount of new business are resulting in lower operating schedules, the range now being 80 to 85 per cent of capacity. Deliveries on most grades range from two to three weeks. Roofing material can be shipped from stocks which were expanded in February and the early part of March.

Base prices per lb., deliv'd from mill in Chicago: No. 24 black sheets, 2.70c. to 2.80c.; No. 24 galv., 3.45c.; No. 10 blue ann'l'd, 2.25c. Deliv'd prices at other Western points are equal to the freight from Gary, plus the mill prices, which are 5c. per 100 lb. lower than Chicago delivered prices.

Ferroalloys.—Sales of these commodities are unusually light. Shipments reflect a substantial volume of consumption.

Pig Iron.—Prices for Northern foundry iron remain at $19.50 a ton, f.o.b. local furnace. Fresh inquiry is active, and contracting is moving forward steadily. Requests for prices are out for about 8000 tons for melters in Indiana, Illinois and Wisconsin. One user is asking for 2000 tons for April delivery. Reports are current that arrangements are being made for the arrival of boat iron at Chicago, also a cargo of silvery. There is still available here some dock iron, which is being disposed of at 50c. to $1 a ton below the market. The Southern iron situation is quiet. Quotations are being made at $13 a ton, Birmingham.

Prices per gross ton at Chicago:

N'th'n No. 2 fdy., sil. 1.75 to 2.25	$19.50
N'th'n No. 1 fdy., sil. 2.25 to 2.75	20.00
Malleable, not over 2.25 sil	19.50
High phosphorus	19.50
Lake Super. charc'l, sil. 1.50	27.04
S'th'n No. 2 fdy	$18.20 to 19.01
Low phos., sil. 1 to 2, copper free	29.50
Silvery, sil. 8 per cent	$28.79 to 29.79
Bess. ferrosilicon, 14-15 per cent	46.29

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnace, not including an average switching charge of 61c. per gross ton.

Reinforcing Bars. — Sentiment in this market continues to improve. New sales aggregate the heaviest so far this year and new projects, on which tonnages are being estimated, total the largest since last fall. Outstanding among awards is 4000 tons for buildings for the American Can Co. at Chicago and at Terre Haute, Ind. State road work plans are rapidly taking shape. Only a few weeks ago Iowa bought a large tonnage of reinforcing bars and now Indiana has closed for 800 tons, which covers only a part of the needs for the 1930 program. Illinois will open bids April 11 on 1400 tons and more is to follow. Some doubt exists here whether the Galesburg, Ill., sewage disposal plant will be constructed as at first planned. This project calls for 2635 tons, but prices are being taken on only 135 tons. Competition remains keen and prices are unsettled when large tonnages are involved.

Wire Products.—Spring expansion in demand for wire and wire products is in evidence, but the change from week to week is unusually slow, with the result that the volume of business as April opens is conceded by producers to be below normal. Use by manufacturers' wire has remained practically stationary over the past few weeks, and there is no indication now of greater consumption in this direction.

Improvement in demand noticeable this week is due to larger distribution by the jobbing trade. Movement of nails is larger in most parts of the country, and reports from the Pacific Coast state that demand is near normal for this time of the year.

Wire mill operations stand between 50 and 55 per cent of capacity. At this rate, shipments balance production, excepting in nails which are being drawn from stocks accumulated during the winter.

Bars. — Changes in production schedules from tillage to harvesting machinery appear to have made little change in demand for steel by the farm implement group. Order books for tractors remain heavy, and production lines are well engaged.

Demand for bars by several automobile parts manufacturers is taken by some as an indication that production of automobiles will soon swing upward. Specifications for mild steel bars are fully up to the average in recent weeks, while current output is not far below the rate of a year ago. Deliveries range from two to six weeks. The iron bar market is quiet, new sales being in small volume.

Several manufacturers of automobile parts have entered larger specifications for alloy steel bars, and shipments are being maintained to builders of farm implements. Base prices for this commodity are steady.

The rail steel bar market is dull and little tonnage for delivery in the second quarter has been booked. Prices are steady at 1.85c. a lb., Chicago Heights.

Structural Material.—Most of the

Warehouse Prices, f.o.b. Chicago

	Base per Lb.
Plates and structural shapes	3.10c.
Soft steel bars	3.00c.
Reinforc'g bars, billet steel—	
Under 5 tons	2.85c.
5 tons to 30 tons	2.45c.
30 tons and over	2.00c.
Rail steel reinforcement	1.75c.
Cold-fin. steel bars and shafting—	
Rounds and hexagons	3.60c.
Flats and squares	4.10c.
Bands (¼ in. in Nos. 10 and 12 gages)	3.20c.
Hoops (No. 14 gage and lighter)	3.75c.
Black sheets (No. 24)	4.05c.
Galv. sheets (No. 24)	4.60c.
Blue ann'l'd sheets (No. 10)	3.35c.
Spikes, ⅜ in. and larger	3.55c.
Track bolts	4.55c.
Rivets, structural	4.00c.
Rivets, boiler	4.00c.

	Per Cent Off List
Machine bolts	60
Carriage bolts	60
Coach or lag screws	60
Hot-pressed nuts, sq., tap. or blank	60
Hot-pressed nuts, hex., tap. or blank	60
No. 8 black ann'l'd wire, per 100 lb.	$3.45
Com. wire nails, base per keg	$2.85 to 2.95
Cement c't'd nails, base per keg	2.85 to 2.95

structural news continues to come from outlying territory. Although Chicago so far this year has seen little activity in this line, there are a number of large projects, both private and public, which are slowly taking shape. Architects in general have little active work on hand, but they are optimistic as to the future.

The general contract has been awarded on the Milwaukee Post Office and subcontracts for the steel needed will be placed at an early date. Bids on the general contract for the Northwestern Mutual Life Insurance Building at Milwaukee will be opened this week. Prominent among inquiries this week is 1000 tons for a court house at Racine, Wis., and round tonnages for railroad bridge work and also highway bridges in Iowa and Texas.

Demand for structural shapes is not far from the tonnage moved in March, 1929. This, of course, is a reflection of activity by car builders rather than of the building industry.

Western plate market in strong position because of heavy releases for pipe manufacture.

* * *

Railroad equipment demand expected to revive soon; Illinois Central to buy 2300 cars.

* * *

Black sheets $2 a ton lower; blue annealed weak.

* * *

Cast iron pipe demand gathers momentum.

* * *

Pig iron melt growing; larger April deliveries expected.

Plates.—Growing demand for steel for gas and oil lines is placing the Chicago plate market in a strong position. The A. O. Smith Corporation, Milwaukee, has released 130,000 tons of plates in recent weeks. The outlook appears to be unusually favorable, particularly in view of the fact that the Smith Corporation is anticipating early release to it of orders that aggregate well over 200,000 tons. Some of the contracts that are being put into effect are the Montana-Dakota Power & Light Co.'s line, the Moody-Seagraves system covering 600 miles and the Pure Oil Co. line of 180 miles. The Milwaukee pipe mill is operating on three shifts.

The Texas Gas Utilities will undertake construction of an extensive gas line system, and the Southern Union Gas Co. plans a 200-mile line from the Southwest into Santa Fe, N. M. The Cities Service Co. plans to connect its entire mid-continent system with a 20-in. line and contracts, it is said, already have been placed. Fully 25,000 tons of plates is pending for oil storage tank construction and demand is active for heavy-walled pressure vessels for oil refinery use.

No less encouraging than demand for steel from the oil and gas industries is an active revival of the railroad car market. It is reported that the New York Central will buy 10,000 cars, the Pennsylvania 6000, the Minneapolis & St. Louis 500, and the Illinois Central 2330 units of various types of equipment.

On the score of developments in the plate market in the last week or 10 days, deliveries have been lengthened at least a week, and it is probable that deliveries will be deferred still further in the near future.

Bolts, Nuts and Rivets.—Second quarter contracting has moved steadily and with little opposition to prices. Specifications remain spotty, though in the aggregate they are in fair volume.

Rails and Track Supplies.—New sales are lacking, but shipments of standard-section rails are close to the capacities of local mills, and track supply departments are operating at a rate which is considered normal for this time of the year. The light rail market is without feature.

Prices f.o.b. mill, per gross ton: Standard section open-hearth and Bess. rails, $43; light rails, rolled from billets, $36. *Per lb.:* Standard railroad spikes, 2.80c.; track bolts with square nuts, 3.80c.; steel tie plates, 2.07½c. to 2.15c.; angle bars, 2.75c.

Cast Iron Pipe.—Demand for cast iron pipe continues to gather momentum from a wide territory surrounding Chicago. The Lynchburg Foundry Co. has taken 300 tons of 10 to 20-in. pipe for Kenosha, Wis., and James B. Clow & Sons have received a contract from Saginaw, Mich., for 500 tons of 6 to 24-in. pipe at $36.15 a ton, Birmingham. The McWane Cast Iron Pipe Co. will supply 8000 ft. of 6 and 12-in. pipe for Muskegon, Mich.; 10,000 ft. of 4 and 6-in. pipe for Garnavillo, Iowa, and 150 tons of 2 to 8-in. pipe for Concord, Neb. The American Cast Iron Pipe Co. will furnish 3000 ft. of 6-in. pipe for Marshfield, Wis., and an unnamed maker will supply 4500 ft. of 2 to 8-in. pipe to Randolph, Iowa.

Among fresh inquiries are 14,700 ft. of 4-in. and 850 ft. of 6-in. pipe, on which Cleo, Mich., will open bids April 3. Two Rivers, Wis., will receive tenders April 4 on 100 tons of 6 and 8-in. Class C pipe, and Akron, Ohio, will open bids April 4 on 1500 tons of 4 to 16-in. pipe. A substantial volume of carload business is being done.

Prices per net ton, deliv'd Chicago: Water pipe, 6-in. and over, $45.20 to $46.20; 4-in., $48.20 to $49.20; Class A and gas pipe, $3 extra.

Coke. — The Chicago by-product foundry coke market is steady. Shipments are in large volume. Prices are stable at $8 a ton, f.o.b. local ovens.

Old Material.—The week's developments in the local scrap market are closely tied in with the recent blizzard. The heavy snow fall put an end for several days to the preparation of scrap and transportation by railroads. Movement to producers and from dealers' yards was practically at a standstill. Incoming shipments still are not heavy, but the trade expects this condition to right itself in less than a week.

Consumption remains as it was a week ago. Steel mills are operating at a high rate, and steel foundries are enjoying a good volume of business. The malleable industry is spotty, and gray iron foundries are in need of work.

About 2000 tons of cast iron borings has been taken by a consumer at $9.75 a gross ton, delivered, a reduction of 25c. from the figure previously paid. Punchings and plate scrap are also off 25c. a ton in a quiet market. Prices for most grades are nominal in the absence of sales which would afford tests.

Lists are being offered by the Pennsylvania, Michigan Central and Chicago & North Western.

Prices deliv'd Chicago district consumers.

Per Gross Ton	
Basic Open-Hearth Grades:	
Heavy melting steel	$13.00 to $13.50
Shoveling steel	13.00 to 13.50
Frogs, switches and guards, cut apart, and misc. rails	13.75 to 14.25
Hydraul. compressed sheets	11.75 to 12.25
Drop forge flashings	9.75 to 10.25
No. 1 busheling	11.00 to 11.50
Forg'd cast and r'l'd steel carwheels	17.00 to 17.50
Railroad tires, charg. box size	17.50 to 18.00
Railroad leaf springs cut apart	17.50 to 18.00
Acid Open-Hearth Grades:	
Steel couplers and knuckles	15.50 to 16.00
Coil springs	18.00 to 18.50
Electric Furnace Grades:	
Axle turnings	12.50 to 13.00
Low phos. punchings	15.00 to 15.50
Low phos. plates, 12 in. and under	14.50 to 15.00
Blast Furnace Grades:	
Axle turnings	10.50 to 11.00
Cast iron borings	9.25 to 9.75
Short shoveling turnings	9.25 to 9.75
Machine shop turnings	7.50 to 8.00
Rolling Mill Grades:	
Iron rails	14.00 to 14.50
Rerolling rails	15.00 to 15.50
Cupola Grades:	
Steel rails less than 3 ft.	16.50 to 17.00
Steel rails, less than 2 ft.	17.00 to 17.50
Angle bars, steel	15.00 to 15.50
Cast iron carwheels	14.50 to 15.00
Malleable Grades:	
Railroad	16.75 to 17.25
Agricultural	15.00 to 15.50
Miscellaneous:	
*Relaying rails, 56 to 60 lb.	23.00 to 25.00
*Relaying rails, 65 lb. and heav.	26.00 to 31.00
Per Net Ton	
Rolling Mill Grades:	
Iron angle and splice bars	14.50 to 15.00
Iron arch bars and transoms	16.50 to 17.00
Iron car axles	25.00 to 25.50
Steel car axles	16.00 to 16.50
No. 1 railroad wrought	12.25 to 12.75
No. 2 railroad wrought	11.75 to 12.25
No. 1 busheling	9.00 to 9.50
No. 2 busheling	7.25 to 7.75
Locomotive tires, smooth	14.50 to 15.00
Pipes and flues	9.25 to 9.75
Cupola Grades:	
No. 1 machinery cast	13.75 to 14.25
No. 1 railroad cast	13.25 to 13.75
No. 1 agricultural cast	11.75 to 12.25
Stove plate	10.50 to 11.00
Grate bars	10.50 to 11.00
Brake shoes	10.00 to 10.50

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

New York

Moderate Improvement in Steel Buying But Prices Are Weak—Pig Iron Sales 12,000 Tons

NEW YORK, April 1.—Pig iron buying continues to make a good showing, with bookings totaling 12,000 tons, compared with 16,000 tons in the previous week and 13,000 tons two weeks ago. While there are scattered evidences of improved melt, it is clear that the main motive for buying is to take advantage of the low prices now prevailing.

The General Electric Co. has closed for 2400 tons, and the E. W. Bliss Co., Brooklyn, has bought against its inquiry for 1000 tons. In New England the outstanding transaction was the purchase of 4000 tons by the H. B. Smith Co., Westfield, Mass. No important inquiries remain unsatisfied, but it has been characteristic of the market for some time that considerable tonnage has been placed quietly without asking all sellers for quotations.

The price situation is substantially unchanged, with all producing centers competing actively for business. A fair tonnage of Buffalo iron has been sold for barge shipment, but no really large volume of such business is looked for until the opening of navigation draws nearer. The State Barge Canal is not expected to open for traffic until the end of this month and, since most of the available barges are at this end of the route, it may take another three or four weeks before deliveries from Buffalo can be made.

Ferroalloys.—Specifications on contract for ferromanganese are fairly active and there are about 1000 tons under negotiation. Sales of about 100 tons of foreign spiegeleisen are noted, with inquiries for substantial tonnages under negotiation. Prices are firm and unchanged.

Prices per gross ton, delivered New York district:

Buffalo No. 2 fdy., sil. 1.75 to 2.25	$20.91 to $21.41
*Buff. No. 2, del'd east. N. J.	19.28 to 19.78
East. Pa. No. 2 fdy., sil. 1.75 to 2.25	19.39 to 21.02
East. Pa. No. 2X fdy., sil. 2.25 to 2.75	19.89 to 21.52

Freight rates: $4.91 from Buffalo, $1.39 to $2.52 from eastern Pennsylvania.

*Prices delivered to New Jersey cities having rate of $3.28 a ton from Buffalo.

Reinforcing Bars.—The amount of pending work is increasing, but contracts are being placed very slowly, possibly because of price uncertainty. The bars for the Pilgrim State Hospital, Brentwood, N. Y., 2000 tons, are still unbought. Highway contruction is looming up as a more important outlet for steel, with 2000 tons pending for a New Jersey job and 1500 tons for the West Street, New York, elevated roadway.

Concrete bars, in 40, 50 and 60-ft. lengths, for mill shipment are quoted at 1.85c. a lb., Pittsburgh. Warehouse prices range from 2.44c., f.o.b. cars, New York, for carloads or larger lots to 3.25c. a lb. for the smallest tonnages.

Finished Steel.—Further price weakness and only moderate gains in the volume of business characterize the continued unsatisfactory condition of steel business. A drop of $4 a ton on steel pipe, extreme irregularity on wire nails, with sales at $2.15 and $2.20 a keg, a further drop of $1 on hot-rolled strip steel and irregularity in sheets and concessions on plates, shapes and bars reflect the widespread character of price weakness.

Orders for various steel products show spotty improvement, with further gains in prospective business. An inquiry for 23,000 tons of fabricated steel for another section of the West Side elevated highway is the outstanding structural project. The largest award was 7000 tons for a building at Fifty-first Street and Lexington Avenue. The city of New York has announced that bids will be taken on various dates in April for $24,000,000 worth of subway work, on which the steel tonnage has not been estimated.

Warehouse Prices, f.o.b. New York

	Base per Lb.
Plates and structural shapes	3.30c.
Soft steel bars, small shapes	3.25c.
Iron bars	3.24c.
Iron bars, Swed. charcoal	7.00c. to 7.25c.
Cold-fin. shafting and screw stock—	
Rounds and hexagons	3.40c.
Flats and squares	3.90c.
Cold-roll. strip, soft and quarter hard	5.05c.
Hoops	4.25c.
Bands	3.75c.
Blue ann'l'd sheets (No. 10)	3.60c.
Black sheets (No. 24*)	3.80c. to 4.00c.
Galvanized sheets (No. 24*)	4.25c. to 4.50c.
Long terne sheets (No. 24)	5.80c.
Standard tool steel	12.00c.
Wire, black annealed	4.50c.
Wire, galv. annealed	5.15c.
Tire steel, ½ x ½ in. and larger	3.40c.
Smooth finish, 1 to 2½ x ¼ in. and larger	3.75c.
Open-hearth spring steel, bases,	4.50c. to 7.00c.

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

	Per Cent Off List
Machine bolts, cut threads:	
¾ x 6 in. and smaller	60
1 x 30 in. and smaller	50 to 50 and 10
Carriage bolts, cut thread:	
½ x 6 in. and smaller	60
¾ x 20 in. and smaller	50 to 50 and 10
Coach Screws:	
½ x 6 in. and smaller	60
1 x 6 in. and smaller	50 to 50 and 10

Boiler Tubes—	Per 100 Ft.
Lap welded, 2-in	$19.00
Seamless steel, 2-in	20.25
Charcoal iron, 2-in	26.25
Charcoal iron, 4-in	67.00

Tin Plate (14 *x* 20 *in.*)

	Prime	Seconds
Coke, 100 lb. base box	$6.45	$6.20
Charcoal, per Box—	A	AAA
IC	$9.70	$12.10
IX	12.00	14.25
IXX	13.90	16.00

Terne Plate (14 *x* 20 *in.*)

IC—20-lb. coating	$10.00 to $11.00
IC—30-lb. coating	12.00 to 13.00
IC—40-lb. coating	13.75 to 14.25

The New York Central opened bids Monday on its usual quarterly steel requirements. One company bid 2c. on No. 10 blue annealed sheets and 2.15c. on No. 13 gage, but otherwise there was little variation from published prices on various steel products. Mills quoted 1.90c., West Seneca, N. Y., on plates, shapes and bars. On plates there were quotations of 1.80c., Newberry Junction.

Mill prices per lb., deliv'd New York: Soft steel bars, 2.14c. to 2.19c.; plates, 2.07½c. to 2.12½c.; structural shapes, 2.04½c. to 2.09½c.

Old Material.—The trend of prices for most grades of scrap is downward, except for No. 1 heavy melting steel, the buying price of which is unchanged at $14 a ton, delivered eastern Pennsylvania. A Phoenixville, Pa., consumer of heavy melting steel has closed on about 1000 tons at $11.50, delivered, on a new specification. This calls for a minimum weight of 35 lb. per cu. ft. and includes galvanized pipe, cut beds, sheet iron not over 5 per cent galvanized and perforated plates. Long scrap must not be more than 12 in. in length and flat over 8 in. square. Most grades of scrap are inactive.

Dealers buying prices per gross ton, f.o.b. New York:

No. 1 heavy melting steel	$10.50
Heavy melting steel (yard)	$7.25 to 7.50
No. 1 hvy. breakable cast	9.25 to 10.00
Stove plate (steel works)	8.00
Locomotive grate bars	8.00
Machine shop turnings	7.00
Short shoveling turnings	7.00 to 7.25
Cast borings (blast fur. or steel works)	7.00
Mixed borings and turnings	6.25 to 6.50
Steel car axles	16.75 to 17.75
Iron car axles	20.50 to 21.00
Iron and steel pipe (1 in. dia., not under 2 ft. long)	9.25 to 9.75
Forge fire	8.50 to 9.00
No. 1 railroad wrought	11.50 to 12.00
No. 1 yard wrought, long	10.50 to 11.50
Rails for rolling	10.50 to 11.00
Stove plate (foundry)	8.75 to 9.00
Malleable cast (railroad)	12.00 to 12.50
Cast borings (chemical)	9.50 to 10.00
Prices per gross ton, deliv'd local foundries:	
No. 1 machry. cast	$15.00
No. 1 hvy. cast (columns, bldg. materials, etc.); cupola size	13.00
No. 2 cast (radiators, cast boilers, etc.)	12.50

Cast Iron Pipe.—Pressure pipe prices show a trend toward greater strength, but are still quotable at $36 to $38 a net ton, f.o.b. Northern foundry. Current inquiries are generally limited to lots of a few hundred tons. The Department of Purchase, New York, will open bids April 9 and 11 on two lots of 300 tons each. Newburgh, N. Y., is inquiring for 225 tons of 8-in. and 16-in. water pipe.

Prices per net ton deliv'd New York: Water pipe, 6-in. and larger, $38.90 to $40.90; 4-in. and 5-in., $41.90 to $43.90; 3-in., $48.90 to $50.90. Class A and gas pipe, $3 extra.

Coke.—Prices are substantially unchanged, with good standard grade furnace coke obtainable at $2.50 to $2.60 a net ton, Connellsville. Special brands of beehive foundry coke continue at $4.85 a net ton, ovens, or $8.56 delivered to northern New Jersey, Jersey City and Newark, and $9.44 to New York and Brooklyn. By-product foundry coke is quoted at $9 to $9.40, Newark or Jersey City; $10.06, New York or Brooklyn.

Philadelphia

Concessions of $1 a Ton On Steel Bars—Railroads Less Active Buyers—Pig Iron Quiet

PHILADELPHIA, April 1.—Steel mill operations are being maintained at a fair rate, but prices still lack firmness. Reported improvement in the automobile industry has not yet been reflected in an increase of operations by body and accessory manufacturers in this district, but it is suggested that a more active automobile industry may serve to offset smaller orders from the railroads. Operations of radio manufacturers are still greatly curtailed. Stove builders, which dispose of their product in the open market, have been fairly well engaged, but manufacturers in the same field, which dispose of most of their output through contracts with public utilities, are in need of orders.

Shipbuilders have not yet closed on large tonnages of plates and shapes required for recently received contracts. Award of one ship has been made to the Newport News Shipbuilding & Dry Dock Co. by the Peninsular & Occidental Steamship Co., and two vessels have been placed with the Bethlehem Shipbuilding Co. by the United Fruit Co.

Pig Iron.—Foundry iron prices are unchanged at $19.50 to $20 a ton, furnace, except when competition is encountered from Southern furnaces, which continue to ship a substantial tonnage of foundry iron into this district at $13 per ton, furnace, or $18.25 a ton, on cars, Philadelphia. Many consumers have operated at such low rates since the first of the year that they still have a considerable tonnage of iron due on first quarter contracts, and show no desire to anticipate their requirements.

Except for the factor of Birmingham competition, curtailment of production in eastern Pennsylvania would tend toward firmer prices. The Delaware River furnace will probably go out of blast by the end of this week, which follows the recent suspension of Keystone furnace. In the basic pig iron market, which is not so seriously threatened by the competition of Southern iron, this curtailment of output and the unwillingness of a steel company furnace to grant any concessions has brought sufficient firmness so that the efforts of two eastern Pennsylvania users of basic iron to buy at $19 per ton, delivered, have not met with success.

Prices per gross ton at Philadelphia:

East. Pa. No. 2, 1.75 to 2.25 sil.	$20.26 to $20.76
East. Pa. No. 2X, 2.25 to 2.75 sil.	20.76 to 21.26
East. Pa. No. 1X	21.26 to 21.76
Basic (del'd east. Pa.)	19.00 to 19.50
Malleable	21.25 to 21.75
Stand. low phos. (f.o.b. east. Pa. furnace)	24.00
Cop. b'r'g low phos. (f.o.b. furnace)	23.00 to 24.00
Va. No. 2 plain, 1.75 to 2.25 sil.	22.29
Va. No. 2X, 2.25 to 2.75 sil.	22.79

Prices, except as specified otherwise, are deliv'd Philadelphia. Freight rates: 76c. to $1.64 from eastern Pennsylvania furnaces; $4.54 from Virginia furnaces.

Bars.—Prices show a range of 1.80c. to 1.85c. a lb., Pittsburgh, or 2.12c. to 2.17c., delivered Philadelphia, following recent quotations of 1.80c., Pittsburgh, by a Southern mill. Existing contracts are in many cases at 1.85c., Pittsburgh, and this quotation still applies on the smaller tonnages.

Reinforcing Bars.—Prices range from 1.90c. to 1.95c., Pittsburgh, or 2.22c. to 2.27c., delivered Philadelphia, for billet steel bars, usually with no extra charge for cutting to length. Rail steel bars are quoted at 1.70c. to 1.75c., Franklin, Pa., and Tonawanda, N. Y., or 2.02c. to 2.07c., delivered Philadelphia, with no extra for cutting to length and bending. Projects requiring reinforcing steel are increasing. A junior high school at Eleventh and Catharine Streets will require about 950 tons. A contract on route 25 of the New Jersey State Highway Commission, on which Arthur McMullen, Inc., New York, is low bidder with a quotation of $3,176,530, will require 2200 tons of bars.

Shapes.—Prices continue irregular, with 1.75c. to 1.80c., f.o.b. nearest mill to consumer, or 1.81c. to 1.86c., delivered Philadelphia, quoted on most current business and 1.85c., mill, or 1.91c., Philadelphia, applying on small lots and the less desirable specifications. Building construction is small. The Pennsylvania Railroad is inquiring for 580 tons of structural material for bridges on the Long Island Railroad, and a junior high school in Philadelphia will require 500 tons. A contract on route 25 of the New Jersey State Highway Commission, on which Arthur McMullen, Inc., New York, is low bidder, will require 600 tons.

Plates.—Buying by oil companies is moderately active, but the railroads are smaller buyers than earlier in the year. Shipbuilders are bidding on some large contracts and have recently received some awards, but have not yet appeared as substantial buyers of plates. The Baldwin Locomotive Works has booked an order from the Central Railroad of New Jersey for 10 small locomotives. Prices continue at 1.85c. to 1.90c., Coatesville, Pa., or 1.95c. to 2c., Philadelphia.

Sheets.—Consumers are still restricting operations and are buying only small lots of sheets. The largest sheet order in this district for some weeks, about 140 tons for car building and repair was placed by a Baltimore city railroad. Blue annealed sheet prices are fairly well maintained, especially in the wider specifications, at 2.25c. a lb., Pittsburgh, or 2.57c., Philadelphia, for No. 13 gage, and blue annealed plates are 2.10c., Pittsburgh, or 2.42c., Philadelphia.

Imports.—In the week ended March 29, 2000 tons of chrome ore was received at this port from Portuguese Africa and 6200 tons of iron ore from Algeria. Steel arrivals consisted of 355 tons of structural shapes from Belgium and 27 tons from France, 58 tons or steel bars from Belgium and 51 tons from France, three tons of steel bands from Belgium and three tons of steel scrap from the United Kingdom.

Old Material.—All grades of scrap are quiet and prices lack strength. A Phoenixville, Pa., mill has bought about 1000 tons of melting steel on a new specification, paying $11.50 a ton, delivered, and the same consumer has closed on a small tonnage of stove plate at $11 per ton, delivered. Other grades are unchanged.

Prices per gross ton delivered consumers' yards, Philadelphia district:

No. 1 heavy melting steel	$14.50
Scrap T rails	14.00
No. 2 heavy melting steel	$11.50 to 12.50
No. 1 railroad wrought	15.00 to 15.50
Bundled sheets (for steel works)	11.50
Hydraulic compressed, new	13.00 to 13.50
Hydraulic compressed, old	12.00 to 13.00
Machine shop turnings (for steel works)	11.00
Heavy axle turnings (or equiv.)	12.50 to 13.50
Cast borings (for steel works and roll. mill)	11.25 to 11.50
Heavy breakable cast (for steel works)	13.50 to 14.00
Railroad grate bars	11.50
Stove plate (for steel works)	11.00 to 11.50
No. 1 low phos., hvy., 0.04% and under	20.50 to 21.50
Couplers and knuckles	20.00 to 20.50
Rolled steel wheels	19.50 to 20.00
No. 1 blast f'nace scrap	10.50
Wrot. iron and soft steel pipes and tubes (new specific.)	14.00
Shafting	19.00
Steel axles	21.00 to 21.50
No. 1 forge fire	13.00
Cast iron carwheels	15.00
No. 1 cast	15.00 to 15.50
Cast borings (for chem. plant)	14.00
Steel rails for rolling	15.00 to 15.50

Warehouse Prices, f.o.b. Philadelphia

	Base per Lb.
Plates, ¼-in. and heavier	2.70c.
Plates, ⅜-in.	2.90c.
Structural shapes	2.70c.
Soft steel bars, small shapes, iron bars (except bands)	2.80c.
Reinforc. steel bars, sq., twisted and deform.	2.60c. to 2.80c.
Cold-fin. steel, rounds and hex.	3.40c.
Cold-fin. steel, sq. and flats	3.90c.
Steel hoops	3.55c.
Steel bands, No. 12 to ⅛-in. inclus.	3.30c.
Spring steel	5.00c.
*Black sheets (No. 24)	3.80c.
†Galvanized sheets (No. 24)	4.45c.
Light plates, blue annealed (No. 10)	3.25c.
Blue ann'l'd sheets (No. 13)	3.40c.
Diam. pat. floor plates, ¼-in.	5.30c.
Rails	3.20c.
Swedish iron bars	6.60c.

*For 50 bundles or more; 10 to 49 bun., 4.10c. base; 1 to 9 bun., 4.35c. base.
†For 50 bundles or more; 10 to 49 bun., 4.95c. base; 1 to 9 bun., 5.30c. base.

Cleveland

Expectations of Spring Gains Improve Steel Trade Sentiment—1929 Ore Prices Reestablished

CLEVELAND, April 1.—The volume of steel business showed little change during the week, although there was a little gain in specifications for some products, particularly sheets. Sheet mills further increased operations this week and on the whole are running better than at any time since last November, although production schedules of automobile body sheets are a little below those of some of the previous weeks.

March business with mills making the heavier rolled products was practically the same in volume as that in February. Cleveland steel plants continue to operate at about 75 per cent of ingot capacity.

There is an improved sentiment in the steel industry, which seems largely due to expectations that the opening of spring will result in a stimulation in business and particularly in activity in the automotive field.

Somewhat more liberal releases have come from the automobile industry for this month, and the April output of cars doubtless will show a moderate gain over March, although Detroit appears to temper its optimism with uncertainty. Stocks of cars in dealers' hands are understood to be low in the case of some makes and not above normal in others.

The steel market lacks strength, and on some products prices that have been minimum quotations have become more common.

Semi-finished Steel.—Contracts for the second quarter have been closed by the leading local producer at the reestablished $33, Cleveland and Youngstown, price for sheet bars, billets and slabs. All consumers who secure their supply from this mill have made contracts. Specifications are fair. The Cleveland producer continues to operate 11 out of 14 open-hearth furnaces.

Pig Iron.—Conditions in the market show an improvement that is due largely to a better demand from the automotive industry. Daily shipments in March by leading producers in this territory averaged about 10 per cent above those in February, while April has started with larger releases for shipment this month. Several of the motor car foundries, as well as independent foundries making motor car castings, are increasing their output somewhat this month.

Sales by Cleveland interests during the week amounted to 27,000 tons. While these fell below the previous week, when 40,000 tons was sold, they were well up to the recent weekly average. Consumers in the immediate territory are still showing hesitancy about making commitments for future delivery and are buying iron only as needed. Jobbing foundry operations in this district are still spotty, but show a slight uptrend.

Prices are being fairly well maintained, although concessions are occasionally made on iron for delivery to competitive points. Cleveland furnaces quote foundry and malleable iron at $18.50 for outside shipment and $19, furnace, for local delivery. These grades range from $18.50 to $19 in northern Indiana and are commonly quoted at $19.50 in Michigan. Southern foundry iron is held at $13.50 in this market.

Prices per gross ton at Cleveland:

N'th'n fdy., sil. 1.75 to 2.25	$19.50
S'th'n fdy., sil. 1.75 to 2.25	19.51
Malleable	19.50
Ohio silvery, 8 per cent	28.00
Basic Valley furnace	18.50
Stand. low phos., Valley	$26.50 to 27.00

Prices except on basic and low phosphorus are delivered Cleveland. Freight rates: 50c. from local furnaces; $3 from Jackson, Ohio; $6.01 from Birmingham.

Bars, Plates and Shapes.—Demand has improved slightly, but the volume of business is still unsatisfactory. Some good steel bar business has come from the rivet industry. Plates are moving fairly well in small lots. Orders include 250 tons of boiler and fire box plates for Boston & Albany locomotives. Inquiry in the building field is still light.

While concessions to 1.80c. are reported, most of the steel bar business is going at 1.85c., Cleveland. On plates, the range of from 1.80c. to 1.85c., Pittsburgh, still exists. Shapes are being held at 1.85c. for most business.

Strip Steel.—Specifications for hot-rolled strip show a slight gain, but the demand for cold-rolled material continues very light. Hot-rolled strip is quite generally quoted at 1.70c., Pittsburgh, for wide and at 1.80c. for narrow to the large consumers in the automotive field. Some mills are holding to prices $2 a ton higher, at which they closed contracts during the week. On cold-rolled strip, 2.55c., Cleveland, has become fairly common except for small lots. Fender stock appears to have been definitely established at 3.90c., Cleveland, a decline of $2 a ton.

Rails.—The Detroit & Toledo Shore Line Railroad has placed 1000 tons of rails, dividing the order between two mills. The Wheeling & Lake Erie Railroad purchased 500 tons.

Reinforcing Bars.—Cleveland has asked for bids for the Fulton Road-Brookside Park bridge and for the remaining piers for the Central Lorain viaduct, each job requiring approximately 1000 tons. The Dayton Soldiers' Home is expected to take 500 tons. No awards of size were reported.

Ore.—Lake Superior ore prices that prevailed last year were reestablished today by open market sales aggregating probably 2,000,000 tons by several Cleveland ore firms. The Ford Motor Co. bought approximately the 330,000 tons it inquired for, this business, or the bulk of it, having been divided among three producers. Several sales of large blocks were made to other consumers, one steel interest purchasing close to 500,000 tons. Several consumers having long term contracts also made commitments.

The guarantee of 51.50 per cent iron natural as a price basis is unchanged. A year ago ore prices were advanced 25c. a ton on all grades after remaining stationary four years.

Sheets.—Specifications, which fell off after a recent spurt of activity, again improved during the week and mills are able to maintain their recent increase in operations. Orders from the automotive industry for April shipment show a fair gain over March, and there is a better demand from some other consuming industries. Steel barrel manufacturers are taking sheets better than for some time, now experiencing a moderate seasonal pick-up in their business. Metal furniture manufacturers have increased operations and are also ordering sheets more freely than recently. A Cleveland automobile body manufacturing plant has suspended shipments for a week, having accumulated considerable backlog of material because it has been taking shipments for 20,000 bodies a week and fabricating only 15,000.

Automobile body sheets are firm at the recent reduction to 3.80c., Pittsburgh. Prices on other grades are steady at 2.65c. for black, 2.25c. for No. 10 blue annealed, 2.10c. for No. 13, 3.30c. for galvanized and 3.90c. for metal furniture sheets.

Old Material.—The market is inactive and weak. One Cleveland mill has taken about all the scrap due on contracts and another is taking very little material, not having made any increase in its releases, which for some time have been greatly curtailed.

Prices per gross ton delivered consumers' yards:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$13.25 to $13.75
No. 2 heavy melting steel	12.75 to 13.25
Compressed sheet steel	12.75 to 13.00
Light bundled sheet stampings	11.00 to 11.50
Drop forge flashings	11.50 to 11.75
Machine shop turnings	9.50 to 9.75
Short shoveling turnings	10.50 to 11.00
No. 1 railroad wrought	13.00 to 13.50
No. 2 railroad wrought	14.00 to 14.50
No. 1 busheling	12.00 to 12.50
Pipes and flues	9.00 to 9.50
Steel axle turnings	12.50 to 13.00
Acid Open-Hearth Grades:	
Low phos., forging crops	17.75 to 18.00
Low phos., billet bloom and slab crops	18.50 to 18.75
Low phos., sheet bar crops	18.00 to 18.50
Low phos., plate scrap	18.00 to 18.50
Blast Furnace Grades:	
Cast iron borings	10.00 to 10.50
Mixed borings and short turnings	10.00 to 10.50
No. 2 busheling	9.00 to 9.50
Cupola Grades:	
No. 1 cast	15.00 to 15.50
Railroad grate bars	11.00 to 12.00
Stove plate	12.00 to 12.50
Rails under 3 ft	18.50 to 19.50
Miscellaneous:	
Rails for rolling	16.25 to 16.50
Railroad malleable	16.00 to 16.50

Pacific Coast

Bookings of Structural Material and Reinforcing Bars Gain and Are Largest in Several Weeks

SAN FRANCISCO, March 29 (*By Air Mail*).--Some improvement in demand for steel products is noted. Bar and structural shape bookings were the largest in seven weeks. Outstanding awards included 1800 tons of shapes for a 48-mile transmission tower line for the San Joaquin Light & Power Co., Fresno, Cal., placed with the Pacific Coast Steel Corporation, and 1000 tons of reinforcing bars for the Medical Arts Building, Tacoma, Wash., secured by the same company.

Pig Iron.—Little of importance transpired this week in the pig iron market. Prices are unchanged.

Prices per gross ton at San Francisco:

•Utah basic	$25.00 to $26.00
•Utah fdy., sil. 2.75 to 3.25	25.00 to 26.00
••Indian fdy., sil. 2.75 to 3.25	25.00 to 26.00

•Delivered San Francisco.
••Duty paid, f.o.b. cars San Francisco.

Bars.—The Pacific Coast Steel Corporation took 212 tons for the east approach of the West Spokane Street bridge, Seattle, and 130 tons for the Graybar Building, Seattle. Pending business now exceeds 8000 tons. Bids are being taken on 2500 tons for a pier for the American Can Co., Seattle. About 1000 tons is involved in a pier project for the Naval Air Station at Pearl Harbor, the general contract for which has been placed. Prices in the San Francisco district remain unchanged at 2.30c., base, on carload lots and up to 2.60c. on smaller quantities. Los Angeles district prices on out-of-stock material are $2 a ton higher. Merchant bar steel continues to move in small lots only. Prices are firm at 2.35c., c.i.f.

Plates.—The Seattle Boiler Works secured 440 tons for five tanks for the Union Oil Co., Seattle. It is reported that the Western Pipe & Steel Co. is low bidder on 3500 tons for a high pressure gas container for the Southern Counties Gas Co., Los Angeles. The California-Hawaiian Sugar Co., Crockett., Cal., is calling for bids on 1800 tons for a 20 or 24-in. welded steel pipe line. Prices continue generally at 2.20c., c.i.f.

Shapes.—The Judson - Pacific Co. took 350 tons for the Live Stock Building, Sacramento, Cal. A pulp plant at Raymond, Wash., for the Willapa Pulp & Paper Mills, involving 400 tons, was booked by the Star Iron Works of Tacoma. Other awards included 242 tons for a transit shed in Oakland, placed with the Herrick Iron Works. Dyer Brothers are low bidders on 1400 tons for a hospital in the Presidio, San Francisco. The Southern Pacific Equipment Co. has an inquiry out for 500 tons for caboose cars. Plain shapes remain firm at 2.35c., c.i.f.

Cast Iron Pipe.—The American Cast Iron Pipe Co. secured 100 tons of 6 and 8-in. Class 150 pipe for Sumner, Wash., and the National Cast Iron Pipe Co. took 147 tons of 10-in. Class 150 pipe for the Government to be delivered in Manila, P. I. San Francisco will buy 127 tons of 6-in. Class 150 pipe. Bids have been opened on 268 tons of 8 and 12-in. Class B pipe for Twenty-ninth Avenue, N. E., Seattle. Bids will be opened April 14 on 212 tons of 4 to 8-in. Class B pipe for the Los Angeles County Water Works District No. 10.

Steel Pipe.—Movement of standard steel pipe remains exceptionally quiet for this time of the year, while demand for oil country goods is practically at a standstill. The Associated Oil Co., San Francisco, has an inquiry out for 18 miles of 6-in. line pipe, involving 900 tons.

Warehouse Prices, f.o.b. San Francisco

	Base per Lb.
Plates and struc. shapes	3.30c.
Soft steel bars	3.30c.
Small angles, ⅞-in. and over	3.15c.
Small angles, under ⅞-in.	3.55c.
Small channels and tees, ¾-in. to 2¾-in.	3.75c.
Spring steel, ¼-in. and thicker	5.00c.
Black sheets (No. 24)	4.90c.
Blue ann'l'd sheets (No. 10)	3.90c.
Galv. sheets (No. 24)	5.30c.
Struc. rivets, ½-in. and larger	5.65c.
Com. wire nails, base per keg	$3.40
Cement c't'd nails, 100 lb. keg	3.40

Birmingham

Increased Demands for Plates, Reinforcing Bars and Wire Products—Pig Iron Shipments Exceed Output

BIRMINGHAM, April 1.—Occasional orders covering second quarter requirements are drifting in, but the tendency of the market is to settle back to a hand-to-mouth basis. The number of the consumers who have not covered their second quarter requirements is sufficiently large to keep a fairly active spot market on the basis of the current melt. Shipping specifications indicate that the foundry melt is holding its own. Merchant producers report a slight margin of increase in shipments over production during March. The base price continues at $14 for No. 2 foundry iron.

The total of active furnaces remains at 17. The Woodward Iron Co. has changed its No. 2 Woodward furnace from foundry to basic iron and the Tennessee company has switched its No. 4 Bessemer furnace from foundry to ferromanganese and its No. 5 Ensley furnace from basic to foundry iron. This leaves nine furnaces on foundry iron, six on basic iron, one on recarburizing iron and one on ferromanganese.

Prices per gross ton, f.o.b. Birmingham dist. furnaces:

No. 2 fdy., 1.75 to 2.25 sil.	$14.00
No. 1 fdy., 2.25 to 2.75 sil.	14.50
Basic	14.00

Finished Steel.—Slight increases are noted in demand for plates, reinforcing bars and wire products. Recent oil and gasoline tank projects have furnished heavy orders for plates for fabricating. Wire products are finding a better distribution among jobbers and mill schedules are better than in some time. Demand for structural shapes is off considerably, being the lowest in several weeks. With the exception of shapes and sheets, specifications are strong and shipments heavy. Production at the finishing mills continues at the maximum based on ingot capacity.

The smaller structural steel fabricating shops are in need of tonnage and the larger ones are reducing backlogs rapidly. The structural steel outlook for the near future is improving with the development of new projects and renewal of old projects. A 33-story hotel at Mobile, Ala., is included in the projected work. Road and bridge work is furnishing important tonnages of reinforcing bars.

Active open-hearths total 20, one more than last week. The Gulf States Steel Co. is completing the rebuilding of two open-hearths, increasing their capacity from 75 to 90 tons each.

Old Material.—Small-lot buying by a few foundries has made no material change in a dull market. The movement of steel scrap continues far below normal. Prices are unchanged.

Prices per gross ton, deliv'd Birmingham dist. consumers' yards:

Heavy melting steel	$13.00 to $13.50
Scrap steel rails	14.00
Short shoveling turnings	9.00
Cast iron borings	9.00
Stove plate	11.50 to 12.00
Steel axles	22.00
Iron axles	23.00
No. 1 railroad wrought	10.00 to 10.50
Rails for rolling	15.50
No. 1 cast	13.00
Tramcar wheels	12.50
Cast iron carwheels	13.00 to 13.50
Cast iron borings, chem.	13.50 to 14.00

Cast Iron Pipe.—The Central Foundry Co. has booked 56,765 ft. of 8 to 10-in. pipe for Summerville, N. C., and the McWane Cast Iron Pipe Co. 8700 ft. of 8-in. for Beaumont, Tex. Contracts are pending on 1000 tons at Shreveport, La., on which bids were opened last week.

Projects up for figures include about 25,000 ft. of 2 to 8-in. pipe for Bruceton, Tenn., to be let April 10; small

tonnages at Hazelhurst and Picayune, Miss., to be awarded this week; 500 tons for Greenville, S. C., for which bids are to be opened today. Norman, Okla., and Akron, Ohio, will open bids on fair-sized projects this week.

Shipping instructions have slowed up some since the new rates became effective on March 20, but plants are still moving current production. Prices are holding at $37 to $38 a ton, Birmingham, on 6-in. and larger sizes.

Coke. — Consumers have covered their second quarter requirements fairly well and many of them have bought through the third quarter. March shipments were under those of March last year. Prices are unchanged from the $5 base.

St. Louis

15,000 Tons of Basic Pig Iron Sold—Plate Mill Operations at 100 Per Cent—Scrap Weaker

ST. LOUIS, April 1. — The sale of 15,000 tons of basic pig iron to an East Side melter for second quarter delivery was made during the week by the St. Louis Gas & Coke Corporation, which also sold 4600 tons of foundry and malleable grades for same delivery. Shipments of this maker in March exceeded 30,000 tons and were greater than for any month since October last. Buying of Southern iron was light.

Prices per gross ton at St. Louis:

No. 2 fdy., sil. 1.75 to 2.25, f.o.b. Granite City, Ill...	$19.50
Malleable, f.o.b. Granite City	20.00
N'th'n No. 2 fdy., deliv'd St. Louis	22.16
Southern No. 2 fdy., deliv'd	17.42 to 18.42
Northern malleable, deliv'd	22.16
Northern basic, deliv'd...	22.16

Freight rates: 75c. (average) Granite City to St. Louis; $2.16 from Chicago; $4.42 from Birmingham

Finished Steel.—Plate operations of the Granite City Steel Co. were at full capacity and sheet operations were at 85 per cent of capacity during the last week. Incoming business is small, and the backlog of orders is light. Jobbers are buying almost nothing, and manufacturers are extremely conservative in placing orders.

Bids will be opened this week on the Herbert S. Hadley Vocational School, which will require 700 tons of reinforcing bars and 150 tons each of structural and ornamental steel.

Old Material.—Further weakness was shown in the scrap market during the week. Buying by the mills in the district is light, and the movement from railroads and country dealers is freer. Selected and No. 2 heavy melting steel are 25c. off, while other items are from 25c. to 50c. lower.

Railroad lists: Pennsylvania, 48,545 tons; Missouri Pacific, 147 carloads; Chicago, Milwaukee, St. Paul & Pacific, 129 carloads; Chicago, Cleveland, Cincinnati & St. Louis, 21 carloads; Mobile & Ohio, 18 carloads, and Chicago, Great Western, seven carloads.

Dealers' buying prices per gross ton, f.o.b. St. Louis district:

Selected heavy melting steel	$13.00 to $13.50
No. 1 heavy melting or shoveling steel	12.25 to 12.75
No. 2 heavy melting or shoveling steel	11.25 to 11.75
No. 1 locomotive tires	14.50 to 15.00
Misc. stand.-sec. rails including frogs, switches and guards, cut apart	12.75 to 13.25
Railroad springs	15.50 to 16.00
Bundled sheets	9.50 to 10.00
No. 2 railroad wrought	12.25 to 12.75
No. 1 busheling	9.75 to 10.25
Cast iron borings and shoveling turnings	9.25 to 9.75
Iron rails	13.00 to 13.50
Rails for rolling	14.00 to 14.50
Machine shop turnings	6.75 to 7.25
Heavy turnings	9.00 to 9.50
Steel car axles	18.50 to 19.00
Iron car axles	25.50 to 26.00
Wrot. iron bars and trans.	20.00 to 20.50
No. 1 railroad wrought	11.50 to 12.00
Steel rails, less than 3 ft.	16.50 to 17.00
Steel angle bars	13.00 to 13.50
Cast iron carwheels	14.00 to 14.50
No. 1 machinery cast	15.25 to 15.75
Railroad malleable	14.25 to 14.75
No. 1 railroad cast	14.00 to 14.50
Stove plate	11.00 to 11.50
Relay. rails, 60 lb. and under	20.50 to 23.50
Relay. rails 70 lb. and over	26.50 to 29.00
Agricult. malleable	13.00 to 13.50

Warehouse Prices, f.o.b. St. Louis

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.15c.
Cold-fin. rounds, shafting, screw stock	3.75c.
Black sheets (No. 24)	4.25c.
Galv. sheets (No. 24)	4.85c.
Blue ann'l'd sheets (No. 10)	3.45c.
Black corrug. sheets (No. 24)	4.30c.
Galv. corrug. sheets	4.90c.
Structural rivets	4.15c.
Boiler rivets	4.15c.
	Per Cent Off List
Tank rivets, ⅞-in. and smaller, 100 lb. or more	65
Less than 100 lb	60
Machine bolts	60
Carriage bolts	60
Lag screws	60
Hot-pressed nuts, sq., blank or tapped, 200 lb. or more	60
Less than 200 lb	50
Hot-pressed nuts, hex., blank or tapped, 200 lb. or more	60
Less than 200 lb	50

Cincinnati

Sheet Demand and Output Balance at 60 Per Cent of Capacity—Pig Iron and Scrap Dull

CINCINNATI, April 1. — While sales of pig iron were a trifle larger than in the week before, the demand is not as brisk as is usual at the beginning of a new quarter. Sales were about 3900 tons. Buyers are entering the market only to cover immediate needs. Despite the comparatively light buying in the first quarter, some consumers are carrying over some of their iron stocks into the second quarter.

No large sales were reported last week, all the tonnage having been sold in quantities ranging from one car to 100 tons. Prices continue the same, Northern iron selling on firm prices and Southern still weak at $13, base Birmingham. The only inquiry before the trade is from a central Ohio consumer for 1000 tons of Northern foundry iron.

Prices per gross ton, deliv'd Cincinnati:

So. Ohio fdy., sil. 1.75 to 2.25	$19.89 to $20.39
Ala. fdy., sil. 1.75 to 2.25	16.69 to 17.69
Ala. fdy., sil. 2.25 to 2.75	17.19 to 18.19
Tenn. fdy., sil. 1.75 to 2.25	17.19 to 17.69
S'th'n Ohio silvery, 8 per cent	26.89

Freight rates, $1.89 from Ironton and Jackson, Ohio; $3.69 from Birmingham.

Finished Steel.—Manufacturers of sheets report a better market tone as for the third week demand and production were about equal to 60 per cent of capacity. The leading independent producer of sheets indicates that this demand is about equal to 75 per cent based on last year's lower capacity. The feature of the market is the well sustained demand from the general trade, which is taking sheets at about 70 per cent of normal. On the other hand, automobile manufacturers have curtailed their specifications to about 35 per cent of normal.

Old Material.—The scrap market is dull and featureless. Some scrap is moving on contract and a few small sales have been reported, but the demand is below normal. Dealers are

Warehouse Prices, f.o.b. Cincinnati

	Base per Lb.
Plates and struc. shapes	3.40c.
Bars, soft steel or iron	3.30c.
New billet reinforc. bars	3.15c.
Rail steel reinforc. bars	3.00c.
Hoops	4.05c.
Bands	3.50c.
Cold-fin. rounds and hex. Squares	3.85c. 4.35c.
Black sheets (No. 24)	4.05c.
Galvanized sheets (No. 24)	4.90c.
Blue ann'l'd sheets (No. 10)	3.45c.
Structural rivets	4.20c.
Small rivets	60 per cent off list
No. 9 ann'l'd wire, per 100 lb.	$3.00
Com. wire nails, base per keg	2.85
Cement c't'd nails, base 100 lb. keg	2.85
Chain, per 100 lb	10.25
	Net per 100 Ft.
Lap-welded steel boiler tubes, 2-in. 4-in.	$16.50 34.50
Seamless steel boiler tubes, 2-in. 4-in.	17.50 36.00

buying carefully and at close prices. They are bidding $1 less on stove plate, 50c. less on heavy melting steel, No. 2 wrought and borings and 25c. less on machine shop turnings than a week ago.

Dealers' Buying prices per gross ton, f.o.b. cars, Cincinnati:

Heavy melting steel	$12.00 to $12.50
Scrap rails for melting	13.25 to 13.75
Loose sheet clippings	8.00 to 8.50
Bundled sheets	10.75 to 11.25
Cast iron borings	8.50 to 9.00
Machine shop turnings	8.00 to 8.50
No. 1 busheling	10.00 to 10.50
No. 2 busheling	6.50 to 7.00
Rails for rolling	13.50 to 14.00
No. 1 locomotive tires	14.25 to 14.75
No. 2 railroad wrought	11.75 to 12.25
Short rails	17.75 to 18.25
Cast iron carwheels	12.00 to 12.50
No. 1 machinery cast	18.50 to 19.00
No. 1 railroad cast	15.00 to 15.50
Burnt cast	10.00 to 10.50
Stove plate	9.00 to 9.50
Brake shoes	10.00 to 10.50
Agricultural malleable	14.00 to 14.50
Railroad malleable	15.00 to 15.50

Coal Rate to Youngstown District Not Justified

WASHINGTON, April 1.—The proposed rail rate of $1.02 a net ton on ex-river bituminous coal from Colona and Conway, Pa., to Youngstown and group points is not justified, the Interstate Commerce Commission announced yesterday. It held that a reasonable maximum rate would be 77c. In ordering cancellation of the tariffs, filed by the Pennsylvania and Pittsburgh & Lake Erie railroads, the commission did so without prejudice to the filing of new schedules carrying the suggested rate of 77c.

The present basic all-rail rate to Youngstown from the Pittsburgh, Connellsville and Fairmont districts, from which the Youngstown iron and steel and other industries draw an annual supply of some 7,000,000 tons of coal, is the Pittsburgh group rate of $1.34 for an average distance of 99 miles, which is representative of the average distance to points in the Youngstown rate group. Warren, Ohio, is within the Youngstown group and takes the Pittsburgh group rate of $1.34. From the Connellsville and Fairmont districts the all-rail rates to Youngstown are $1.42 and $1.58 respectively.

Better Employment in the Chicago District

Slight improvement in manufacturing employment is reported by the Federal Reserve Bank of Chicago for the period Jan. 15 to Feb. 15. The general level for ten groups is brought by this gain to approximately that in the middle of December, but continues lower than for the corresponding period of last year. The vehicles group continued the expansion begun between Dec. 15 and Jan. 15. Four other groups, which declined prior to Jan. 15, registered increases during the subsequent month. These groups were wood products, textiles, leather and metals. The upturn of the metal products group was effected largely by expansion in the steel industry.

Buffalo

Pig Iron Sales 10,000 Tons or More—Steel Mill Operations Gain Slightly—Scrap Prices Decline

BUFFALO, April 1.—Aggregate pig iron sales in the district in the past week were 10,000 to 12,000 tons. One maker sold 2000 to 3000 tons; another about 4000 tons; another 2000 tons, and another approximately 3000 tons. Most of this business was taken in 300 to 500-ton orders. A portion of the General Electric inquiry of 2500 tons of No. 2 plain foundry, reported some weeks ago, has been booked. Most of the larger buyers have closed for their second quarter requirements, but there is still considerable iron to be placed.

A sale of basic is noted at $17.50. Prices of Buffalo iron in the East are $16.50 to $17, while in the district the price is firm at $18.50. A large portion of the iron sold during the past week was in the immediate district. The Donner Steel Co., which has been operating one furnace for two months, is putting another into blast this week on foundry iron.

Prices per gross ton, f.o.b. furnace:

No. 2 fdy., sil. 1.75 to 2.25	$18.50
No. 2X fdy., sil. 2.25 to 2.75	19.00
No. 1 fdy., sil. 2.75 to 3.25	20.00
Malleable, sil. up to 2.25	19.00
Basic	17.50
Lake Superior charcoal	27.28

Finished Steel.—Operations of Buffalo mills are slightly improved. Bethlehem's Lackawanna plant is operating 22 of its 24 open-hearths, with about 60 per cent of its mills on double turn and the remainder on single turn. The Donner Steel Co. operation is five open-hearths. The Seneca Iron & Steel Co. is operating at close to 90 per cent, and the Wickwire-Spencer Steel Corporation at about 66 per cent. Steel business shows a better demand for practically all lines.

Old Material.—The market has sagged, and there seems to be almost an entire absence of buying. Most of the dealers are busy on old orders, and scrap is easier to pick up than it was a week ago. The reaction seems to have affected almost every grade on the list. About the only sale noted during the past week was one of No. 1 machinery cast at $13.

Warehouse Prices, f.o.b. Buffalo

	Base per Lb.
Plates and struc. shapes	3.40c.
Soft steel bars	3.30c.
Reinforcing bars	2.95c.
Cold-fin. flats and sq	3.65c.
Rounds and hex	3.15c.
Cold-rolled strip steel	5.85c.
Black sheets (No. 24)	4.20c.
Galv. sheets (No. 24)	4.85c.
Blue ann'l'd sheets (No. 10)	3.50c.
Com. wire nails, base per keg	$3.20
Black wire, base per 100 lb	3.50

Prices per gross ton f.o.b. Buffalo consumers' plants:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$14.00 to $15.00
No. 2 heavy melting scrap	12.50
Scrap rails	14.00 to 15.00
Hydraul. comp. sheets	12.50
Hand bundled sheets	10.00 to 10.50
Drop forge flashings	12.50
No. 1 busheling	13.00 to 13.75
Hvy. steel axle turnings	13.00 to 13.50
Machine shop turnings	8.75 to 9.25
No. 1 railroad wrought	10.50 to 11.00
Acid Open-Hearth Grades:	
Knuckles and couplers	17.50 to 18.00
Coil and leaf springs	17.50 to 18.00
Rolled steel wheels	17.50 to 18.00
Low phos. billet and bloom ends	17.50 to 18.00
Electric Furnace Grades:	
Short shov. steel turnings	11.50 to 12.00
Blast Furnace Grades:	
Short mixed borings and turnings	10.50 to 11.00
Cast iron borings	10.50 to 11.00
No. 2 busheling	8.00
Rolling Mill Grades:	
Steel car axles	16.50 to 17.00
Iron axles	19.50 to 20.00
Cupola Grades:	
No. 1 machinery cast	12.75 to 13.00
Stove plate	11.75 to 12.25
Locomotive grate bars	10.00 to 10.50
Steel rails, 3 ft. and under	17.00 to 17.50
Cast iron carwheels	11.50 to 12.00
Malleable Grades:	
Industrial	16.00 to 16.50
Railroad	16.00 to 16.50
Agricultural	16.00 to 16.50
Special Grades:	
Chemical borings	11.50 to 12.00

Detroit

April Automobile Production Expected to Show Substantial Gain Over That of March

DETROIT, April 1.—While buying of steel for April shipment by automobile companies is reported to be somewhat better than that for March, the fact remains that the motor car industry has failed to show its customary upward trend during March, and, on the contrary, there have been declines in some instances from the schedules that were put into effect at the beginning of the month. It is said that the total output for March will show no gain, and may show a loss, as compared with either January or February, and it was only 45 per cent of the production attained in March, last year.

Dealers found themselves so heavily loaded with cars shipped to them in the first two months of the year, in addition to left-over stocks of old models and used cars, that factories were compelled to slow down operations during the past month. Dealers have been able to clean out stocks fairly well and now are in the best position in six months.

The Ford Motor Co. is on a daily schedule of 6000 cars; the Chevrolet plants are turning out 3000 a day, and

the Willys-Overland Co., 500 a day, as against 1700 a year ago. Hudson-Essex is operating four days this week, at a rate of 600 cars a day, as against two days last week.

Much uncertainty prevails here with regard to the future trend in automobile production. If good weather prevails, there is a strong possibility that April output figures will exceed those of March by a substantial margin.

No sales of tonnage lots of old material have been reported during the past week. Steel mills and furnaces continue to hold up shipments. Prices of some grades of scrap declined 25c. a ton.

Dealers' buying prices per gross ton, f.o.b. cars, Detroit:

Hvy. melting and shov. steel	$11.50 to $12.00
Borings and short turnings	8.00 to 8.50
Long turnings	7.25 to 7.75
No. 1 machinery cast	11.50 to 12.00
Automotive cast	13.00 to 13.50
Hydraul. comp. sheets	11.25 to 11.75
Stove plate	9.00 to 9.50
New No. 1 busheling	10.50 to 11.00
Old No. 1 busheling	8.75 to 9.25
Sheet clippings	8.25 to 8.75
Flashings	10.00 to 10.50

Boston

Pig Iron Prices Again Shaded on Week's Business—Scrap Quiet with Price Tendency Downward

BOSTON, April 1.—Low prices were made on a part of the pig iron business closed in the past week. In one instance, Buffalo iron was offered at $20 a ton, delivered, equivalent to less than $16 at the furnace. Competitive furnaces went lower than this price on a delivered basis.

The H. B. Smith Co., Westfield, Mass., heater manufacturer, was the principal buyer during the week, having closed for 4000 tons or more with two Eastern furnaces. In addition to this tonnage, 3500 tons was booked in scattered lots.

Foundry iron prices per gross ton deliv'd to most New England points:

†Buffalo, sil. 1.75 to 2.25	$20.28 to $21.28
†Buffalo, sil. 2.25 to 2.75	20.78 to 21.78
*Buffalo, sil. 1.75 to 2.25	20.91 to 21.91
*Buffalo, sil. 2.25 to 2.75	21.41 to 22.41
Va., sil. 1.75 to 2.25	25.21
Va., sil. 2.25 to 2.75	25.71
*Ala., sil. 1.75 to 2.25	22.61
*Ala., sil. 2.25 to 2.75	23.11
†Ala., sil. 1.75 to 2.25	18.75
†Ala., sil. 2.25 to 2.75	19.25

Freight rates: $4.91 all rail and $4.28 rail and water from Buffalo; $5.21 all rail from Virginia; $9.61 all rail from Alabama and $5.75 rail and water from Alabama to New England seaboard.

*All rail rate.

†Rail and water rate.

Warehouse Prices, f.o.b. Boston

	Base per Lb.
Plates	3.365c.
Structural shapes—	
Angles and beams	3.365c.
Tees	3.365c.
Zees	3.465c.
Soft steel bars, small shapes	3.265c.
Flats, hot-rolled	4.15c.
Reinforcing bars	3.265c. to 3.54c.
Iron bars—	
Refined	3.265c.
Best refined	4.60c.
Norway rounds	6.60c.
Norway squares and flats	7.10c.
Spring Steel—	
Open-hearth	5.00c. to 10.00c.
Crucible	12.00c.
Tie steel	4.50c. to 4.75c.
Bands	4.015c. to 5.00c.
Hoop steel	5.50c. to 6.00c.
Cold-rolled steel—	
Rounds and hex	*3.55c. to 5.55c.
Squares and flats	*4.05c. to 7.05c.
Toe calk steel	6.00c.
Rivets, structural or boiler	4.50c.

	Per Cent Off List
Machine bolts	50 and 5
Carriage bolts	50 and 5
Lag screws	50 and 5
Hot-pressed nuts	50 and 5
Cold-punched nuts	50 and 5
Stove bolts	70 and 10

*Including quantity differentials.

Old Material.—Business in old material is quieter than heretofore and is largely confined to car lots of steel turnings, steel mill borings, long bundled skeleton, forge flashings, mixed borings and turnings, shafting and axles. No. 1 heavy melting steel for Worcester, Mass., delivery is moving in a limited way at around $10.35 a ton, on cars shipping point; for eastern Pennsylvania delivery, at around $9.60; and for Pittsburgh delivery, usually at $10 to $10.25. One concern is buying steel turnings on an old order at $6.50 a ton on cars, but that price is quite a little out of line with average going prices. Demand for specification pipe has been absolutely flat. The Boston & Albany Railroad on April 1 closed bids on a small list of miscellaneous scrap. A steamer will soon begin loading No. 2 heavy melting steel for Danzig, and it is reported exporters will pay around $9.50 a ton, on dock here, for material.

Buying prices per gross ton, f.o.b. Boston rate shipping points:

No. 1 heavy melting steel	$9.60 to $10.35
Scrap T rails	10.00 to 10.30
Scrap girder rails	9.00 to 9.50
No. 1 railroad wrought	10.00 to 11.00
Machine shop turnings	6.00 to 6.25
Cast iron borings (steel works and rolling mill)	5.50 to 6.00
Bundled skeleton, long	8.75 to 9.25
Forge flashings	8.50 to 9.00
Blast furnace borings and turnings	5.25 to 6.00
Forge scrap	8.00 to 8.50
Shafting	14.00 to 14.50
Steel car axles	15.50 to 16.00
Wrought pipe, 1 in. in diameter (over 2 ft. long)	8.85 to 9.00
Rails for rolling	10.50 to 11.00
Cast iron borings, chemical	8.50 to 9.00

Prices per gross ton deliv'd consumers' yards:

Textile cast	$13.00 to $13.50
No. 1 machinery cast	14.50 to 15.25
No. 2 machinery cast	14.00 to 14.50
Stove plate	11.00 to 11.50
Railroad malleable	16.50 to 17.00

Reinforcing Steel.—Local sales of billet steel reinforcing bars the past week approximated 300 tons. There is still a sizable tonnage of business overhanging the market. Prices are: 1 to 5-ton lots, 3.06½c. a lb., base, from stock; 5 to 99 tons, 2.66½c.; 100-ton and larger lots, 2.56½c.

Cast Iron Pipe.—Walpole, Mass., has closed bids on a round tonnage of 6, 8, 10 and 12-in. pipe, and Marlboro, Mass., has just closed bids on approximately 500 lengths of 6 to 10-in. stock. Westboro, Mass., has appropriated $175,000 for 6-in. pipe, etc.; Braintree, Mass., $62,260 for 6-in. and larger pipe; Andover, Mass., $80,000 for a water system addition; and Lexington, Mass., $30,000 for a water main extension. Massachusetts closes bids April 8 on a small tonnage of pipe. Prices are steady at $37 a ton, on cars, foundry, for 6-in. and larger dimensions. A $4 differential is asked on Class A and gas pipe.

Canada

Northern Alberta Road Buys 11,000 Tons of Rails

TORONTO, April 1.—The Northern Alberta Railway Co., jointly owned by the Canadian Pacific and Canadian National, has ordered 11,000 tons of steel rails. The Dominion Iron & Steel Co., Sydney, N. S., will roll 5000 tons and the Algoma Steel Corporation 6000 tons.

February pig iron production in Canada totaled 70,600 gross tons, which was 19 per cent under the 87,079 tons of January. The curtailment was entirely in foundry and malleable grades, which more than offset the gain made in the production of basic iron. Output of steel ingots and direct steel castings for the month, at 106,612 tons, compares with 115,200 tons in January.

Pig Iron.—More than 50 per cent of those who place quarterly contracts are now covered to the end of June and others are coming into the market. Some substantial tonnages are involved in the orders recently closed, and inquiries in the hands of producers indicate that other large orders are pending.

Prices per gross ton:

Delivered Toronto	
No. 1 fdy., sil. 2.25 to 2.75	$22.60
No. 2 fdy., sil. 1.75 to 2.25	22.10
Malleable	22.60
Delivered Montreal	
No. 1 fdy., sil. 2.25 to 2.75	$24.00
No. 2 fdy., sil. 1.75 to 2.25	23.50
Malleable	24.00
Basic	22.50
Imported Iron, Montreal Warehouse	
Summerlee	$33.50
Carron	33.00

Old Material.—Orders are running in small tonnages, with consumers buying mostly for immediate requirements.

Dealers' buying prices:

	Per Gross Ton	
	Toronto	Montreal
Heavy melting steel	$9.00	$8.00
Rails, scrap	11.00	9.00
No. 1 wrought	9.00	11.00
Machine shop turnings	7.00	6.00
Boiler plate	7.00	6.50
Heavy axle turnings	7.50	6.50
Cast borings	6.50	5.00
Steel borings	6.50	6.00
Wrought pipe	6.00	6.00
Steel axles	14.00	17.00
Axles, wrought iron	16.00	19.00
No. 1 machinery cast	....	16.00
Stove plate	....	12.00
Standard carwheels	....	14.50
Malleable	....	13.00
Per Net Ton		
No. 1 mach'ry cast	$15.00	....
Stove plate	11.00	....
Standard carwheels	14.00	....
Malleable scrap	11.00	....

Non-Ferrous Metal Markets

Copper Firm—Tin Lower and Inactive—Lead Advanced —Zinc Weak

NEW YORK, April 1.

Copper.—March has been a more satisfactory month as to sales than January or February, but the volume is still small. Some producers say that domestic transactions the past week were larger than had been expected, partly because some of them were quietly negotiated. It is reported that some fabricators are busier than any time this year, particularly the wire producers. Brass makers are also stated to be more active. Total sales abroad for March will probably approximate 35,000 gross tons, which is a little larger than the total for each of the first two months.

For some reason very little is heard concerning any possible reduction in prices. It is suggested that buyers are possibly resigned to the 18c. level. Electrolytic copper is quoted unchanged at 18c., delivered in the Connecticut Valley, with the price of Copper Exporters, Inc., 18.30c., c.i.f. usual European ports. Lake copper is moderately active at 18c. to 18.12½c., delivered.

It is freely acknowledged that statistics for March will show a substantial increase in stocks of refined metal. Sales have not been sufficient to offset output, which does not yet reflect curtailment in mine production, instituted early this year.

Copper Averages.—The average price of Lake copper for March, based on daily quotations in THE IRON AGE, was 18.12½c., delivered New York. The price of electrolytic copper was 17.75c., refinery, or 18c., delivered in the Connecticut Valley.

Tin.—That the curtailment in output of tin, so strongly advocated recently, is not being lived up to is emphatically demonstrated by March statistics made public today. Their announcement resulted in a bad break in the London market and a corresponding decline here. London prices today were down about £4 per ton from yesterday, with spot standard quoted at £166 7s. 6d., future standard at £168 2s. 6d. and spot Straits at £168 12s. 6d. These prices were also about £3 to £4 less than the quotations prevailing one week ago, March 25. The Singapore price today was £174 7s. 6d.

As to statistics, the March deliveries to the United States were 8675 tons, which was larger than expected, due to tin stored in transit and to

THE WEEK'S PRICES. CENTS PER POUND FOR EARLY DELIVERY

	Apr. 1	Mar. 31	Mar. 29	Mar. 28	Mar. 27	Mar. 26
Lake copper, New York	18.12½	18.12½	18.12½	18.12½	18.12½	18.12½
Electrolytic copper, N. Y.*	17.75	17.75	17.75	17.75	17.75	17.75
Straits tin, spot, N. Y.	36.75	37.75	....	37.62½	37.37½	37.50
Zinc, East St. Louis	4.82½	4.85	4.85	4.85	4.85	4.85
Zinc, New York	5.17½	5.20	5.20	5.20	5.20	5.20
Lead, St. Louis	5.60	5.60	5.60	5.60	5.60	5.60
Lead, New York	5.75	5.75	5.75	5.75	5.75	5.75

*Refinery quotation; price ¼c. higher delivered in the Connecticut Valley.

Rolled Products

List Prices, Per Lb., f.o.b. Mill

On Copper and Brass Products, Freight up to 75c. per 100 Lb. Allowed on Shipments of 500 Lb. or Over

Sheets—
- High brass ..... 23.25c.
- Copper, hot rolled ..... 26.75c.
- Zinc ..... 10.00c.
- Lead (full sheets) ..... 9.50c.

Seamless Tubes—
- High brass ..... 28.25c.
- Copper ..... 29.25c.

Rods—
- High brass ..... 21.25c.
- Naval brass ..... 24.00c.

Wire—
- Copper ..... 19.87¼c.
- High brass ..... 23.75c.

Copper in Rolls ..... 26.75c.
Brazed Brass Tubing ..... 30.87½c.

Aluminum Products in Ton Lots

The carload freight rate is allowed to destinations east of Mississippi River and also to St. Louis on shipments to points west of that river.

- Sheets, 0 to 10 gage, 3 to 30 in. wide ..... 31.30c.
- Tubes, base ..... 42.00c.
- Rolled rods in coils ..... 31.00c.

Chicago Warehouse

(Prices Cover Trucking to Customers' Doors in City Limits)

Sheets—	Base per Lb.
High brass	23.25c.
Copper, hot rolled	27.75c.
Copper, cold rolled, 14 oz. and heavier	30.00c.
Zinc	10.75c.
Lead, wide	10.05c.
Seamless Tubes—	
Brass	28.25c.
Copper	29.25c.
Brass Rods	21.25c.
Brazed Brass Tubes	31.00c.

New York or Cleveland Warehouse

Delivered Prices, Base per Lb.

High brass	21.12½c.	to 22.12½c.
Copper, hot rolled, base sizes	27.75c.	to 28.75c.
Copper, cold rolled, 14 oz. and heavier, base sizes	30.00c.	to 31.00c.
Seamless Tubes—		
Brass	26.00c.	to 27.00c.
Copper	29.12½c.	to 30.12½c.
Brass Rods	18.87½c.	to 19.87½c.
Brazed Brass Tubes	29.12½c.	to 30.12½c.

New York Warehouse

Delivered Prices, Base per Lb.

- *Zinc sheets (No. 9), casks* ..... 10.25c. to 11.00c.
- *Zinc sheets, open* ..... 11.25c. to 11.75c.

Metals from New York Warehouse

Delivered Prices, Per Lb.

Tin, Straits pig	39.75c. to 40.75c.
Tin, bar	41.75c. to 42.75c.
Copper, Lake	19.50c.
Copper, electrolytic	19.25c.
Copper, casting	19.00c.
Zinc, slab	6.25c. to 7.25c.
Lead, American pig	6.75c. to 7.25c.
Lead, bar	8.25c. to 8.75c.
Antimony, Asiatic	10.50c. to 11.00c.
Aluminum No. 1 ingots for remelting (guaranteed over 99% pure)	25.00c. to 26.00c.
Alum. ingots, No. 12 alloy	24.00c. to 25.00c.
Babbitt metal, commercial grade	25.00c. to 35.00c.
Solder, ½ and ½	26.00c. to 27.00c.

Metals from Cleveland Warehouse

Delivered Prices, Per Lb.

Tin, Straits pig	42.00c.
Tin, bar	44.00c.
Copper, Lake	19.50c.
Copper, electrolytic	19.25c.
Copper, casting	18.75c.
Zinc, slab	7.50c. to 7.75c.
Lead, American pig	6.50c. to 6.75c.
Lead, bar	8.75c.
Antimony, Asiatic	16.00c.
Babbitt metal, medium grade	17.50c.
Babbitt metal, high grade	45.00c.
Solder, ½ and ½	27.50c.

Old Metals, Per Lb., New York

Buying prices represent what large dealers are paying for miscellaneous lots from smaller accumulators and selling prices are those charged consumers after the metal has been properly prepared for their uses.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	15.00c.	16.50c.
Copper, hvy. and wire	14.50c.	16.25c.
Copper, light and bottoms	12.50c.	14.00c.
Brass, heavy	8.00c.	9.25c.
Brass, light	6.75c.	7.75c.
Hvy. machine composition	11.25c.	12.25c.
No. 1 yel. brass turnings	9.00c.	9.50c.
No. 1 red brass or compos. turnings	10.50c.	11.75c.
Lead, heavy	4.25c.	4.62½c.
Lead, tea	3.00c.	3.50c.
Zinc	2.75c.	3.25c.
Sheet aluminum	10.00c.	12.00c.
Cast aluminum	9.50c.	11.50c.

some metal shipped out in March against April payments. The world's visible supply decreased 609 tons and now stands at 32,972 tons. The large decline in London prices today was also influenced by the fact that estimated output of Straits tin in April is put at 10,500 tons, which is exceedingly large. During the week, buying has naturally been very light.

Spot Straits tin was quoted today at 36.75c., New York, down 1c. from yesterday. About 150 tons was sold, spread over several months' deliveries.

Lead.—Another advance was made by the American Smelting & Refining Co. in its contract price on March 26 from 5.65c. to 5.75c., New York. The corresponding price in the West is 5.60c., St. Louis. Buying, which had been very active the past two weeks, has quieted down measurably, though demand is still very good. Most of the metal has been sold for April delivery, with some May metal included, though producers are inclined to commit themselves as far ahead as May only when necessary.

Zinc.—An analysis of the situation shows that sales of prime Western zinc the past week and for the month have been fairly large, although on the surface the market has generally been quiet. In this market many contracts are negotiated without formal inquiries. For the greater part of the past week the price has remained at 4.85c., East St. Louis, but today there has been some softening and some metal is reported to have changed hands at as low as 4.80c. The market is quotable at a range of 4.80c. to 4.85c., East St. Louis, and is generally dull on the surface. Some producers will not sell below 4.85c.

There have been some declines in the ore market at Joplin, Mo., sales at the week-end having been made at $35 to $36 a ton. Purchasers would not buy at the $37 level. Production of ore for the week was about 9500 tons, as compared with 9800 tons the previous week, but sales, last week, were only about 4480 tons, with the average for the first three weeks of the month about 6400 tons per week.

Antimony.—Chinese metal in a quiet market is quoted at 8c. spot, New York, with futures at 7.87½c.

Nickel.—Wholesale lots of ingot nickel are quoted at 35c. a lb., with shot nickel at 36c. and electrolytic nickel in cathodes at 35c.

Aluminum.—Virgin metal, 98 to 99 per cent pure, is quoted at 23.90c., delivered, according to published quotations.

Non-Ferrous Metals at Chicago

CHICAGO, April 1.—Prices show firmness and new sales are in greater volume. Quotations for lead are higher. The old metal market is more active and some prices are advanced.

Prices per lb., in carload lots: Lake copper, 18.50c.; tin, 38.60c.; lead, 5.70c.; zinc, 5c.; in less-than-carload lots, antimony, 9c. On old metals we quote copper wire, crucible shapes and copper clips, 14c.; copper bottoms, 11.50c.; red brass, 11.50c.; yellow brass, 8c.; lead pipe, 4.25c.; zinc, 2.50c.; pewter, No. 1, 19c.; tin-foil, 21c.; block tin, 26.50c.; aluminum, 9.25c.; all being dealers' prices for less-than-carload lots.

Fabricated Structural Steel

New Projects, Largest Year, Total 68,000 Tons—23,000 Tons for New York Elevated Highway

THE past week was the largest of the year in new projects, with a total of 68,000 tons of structural steel inquiry. The largest project is 23,000 tons required in the second section of the West Side elevated highway, New York. Another large inquiry calls for 6000 tons for a life insurance building in Milwaukee. Awards totaling about 22,000 tons were slightly larger than those of the previous week, and included 7000 tons in a 50-story office building in New York. A substantial tonnage of steel will be required for subway contracts in New York totaling about $24,000,000.

Some increase in building is expected in New York following the signing of an ordinance by the mayor permitting an increase in the working stress of structural steel from the former maximum of 16,000 lb. to 18,000 lb. per sq. in. Awards follow:

HOOKSET, N. H., 1700 tons, bridge for Boston & Maine Railroad, to American Bridge Co.

EVARTS, VT., 325 tons, bridge for Central Vermont Railroad, to American Bridge Co.

WALTHAM, MASS., 500 tons, State hospital, to Palmer Steel Co.

BOSTON, 520 tons, Edison Electric & Illuminating Co. Scotia Street power plant, to Eastern Bridge & Structural Co.

SOUTH LAWRENCE, MASS., 400 tons, Boston & Maine bridge, to Shoemaker Bridge Co.

BRIDGEPORT, CONN., 250 tons, mill building and crane runway for Heppenstall Forge Co., to Porcupine Co.

NEW YORK, 7000 tons, building at Fifty-first Street and Lexington Avenue, to McClintic-Marshall Co.

NEW YORK CENTRAL RAILROAD, 600 tons, grade crossing elimination at 158th Street, New York, to McClintic-Marshall Co.

BROOKLYN, 250 tons, St. Thomas Aquinas Church on Flatbush Avenue, to Reliance Steel Fabricators.

ONEIDA, N. Y., 325 tons, shop for Oneida-craft, Inc., to McClintic-Marshall Co.

BOSTON & MAINE RAILROAD, 208 tons, bridge at Valley Falls, N. Y., to Phoenix Bridge Co.

ROCHESTER, N. Y., 850 tons, bridge, to McClintic-Marshall Co.

BUFFALO, 150 tons, school building, to Buffalo Structural Steel Co.

CARNEY'S POINT, N. J., 500 tons, tetraethyl building for du Pont Engineering Co., to Bethlehem Steel Co.

BRADFORD, PA., 200 tons, Bell Telephone Building, to McClintic-Marshall Co.

NORFOLK & WESTERN RAILROAD, 700 tons, pier shed at Norfolk, Va., to Virginia Bridge & Iron Co.

WEIRTON, W. VA., 250 tons, oven steel work for Weirton Steel Co., to McClintic-Marshall Co.

DETROIT, 300 tons, Dix Avenue grade crossing elimination, to McClintic-Marshall Co.

CLEVELAND, 300 tons, catenary bridges for Cleveland Union Terminals Co., to American Bridge Co.

CHICAGO, 450 tons, sub-station for Commonwealth Edison Co., to McClintic-Marshall Co.

CHICAGO, 250 tons, Congress Street sub-station for Commonwealth Edison Co., to Wendnagel & Co.

DUBUQUE, IOWA, 500 tons, boat for an unnamed purchaser, to Dubuque Boat & Boiler Co.

WAUSAU, WIS., 370 tons, bridge, to Wausau Iron Works.

ILLINOIS CENTRAL, 650 tons, bridge work in Kentucky, to Louisville Bridge & Iron Co.

OKLAHOMA CITY, OKLA., 800 tons, bridge, to Virginia Bridge & Iron Co.

KANSAS CITY, MO., 425 tons, viaduct, to Wisconsin Bridge Co.

SEATTLE, 440 tons, plates, five tanks for Union Oil Co., to Seattle Boiler Works.

RAYMOND, WASH., 400 tons, pulp plant for Willapa Pulp & Paper Mills, to Star Iron Works.

OAKLAND, CAL., 242 tons, transit shed for Oakland Port Commission, to Herrick Iron Works.

FRESNO, CAL., 1800 tons, 48 miles of transmission towers for San Joaquin Light & Power Co., to Pacific Coast Steel Corporation.

SACRAMENTO, 350 tons, live stock building, to Judson-Pacific Co.

Structural Projects Pending

Inquiries for fabricated steel work include the following:

STATE OF INDIANA, 100 tons, highway bridges.

DETROIT, 300 tons, building for People's Building & Loan Co.

DETROIT, 130 tons, Wayne County highway bridge.

BATTLE CREEK, MICH., 1500 tons, bank building.

RACINE, WIS., 1000 tons, court house.

STATE OF IOWA, 1000 tons, highway bridges.

NORTHERN PACIFIC, 500 tons, bridge at Topeka, Minn.

GRAND ISLAND, NEB., 200 tons, building for International Harvester Co.

HOUSTON, TEX., 500 tons, power house.

FORT WORTH, TEX., 1000 tons, depot for Texas & Pacific Railroad.

MILWAUKEE ROAD, 400 tons, bridge.

ST. LOUIS, 300 tons, 150 tons structural and 150 tons ornamental, Herbert Hadley Vocational School, for St. Louis Board of Education.

KANSAS CITY, MO., 1300 tons, Bryant Building.

SAN FRANCISCO, 1400 tons, hospital at Presidio; Dyer Brothers low bidders.

SAN FRANCISCO, 1800 tons, plates, 20 or 24-in. welded steel pipe line for California-Hawaiian Sugar Co. at Crockett, Cal.; bids being taken.

LOS ANGELES, 3500 tons, plates, high-pressure gas holder for Southern Counties Gas Co.; Western Pipe & Steel Co. low bidder.

HARTFORD, CONN., 1500 tons, State office building.

NEW HAVEN, CONN., 250 tons, New York, New Haven & Hartford central heating plant.

WELLESLEY, MASS., 100 tons, Babson Institute dormitory.

STATE OF MAINE, 160 tons, five bridges.

NEW YORK, 23,000 tons, section of West Street elevated highway.

NEW YORK, 500 tons, ramp on West Side elevated highway.

NEW YORK, 5000 tons, new roadway on Queensborough bridge.

NEW YORK, 300 tons, school No. 22 in Richmond; bids in.

NEW YORK, 1500 tons, apartment building on West Sixty-seventh Street.

NEW YORK, 2000 tons, apartment building at Seventh Avenue and Christopher Street, Easton Structural Steel Co. low bidder. Work postponed.

STATE OF WEST VIRGINIA, 400 tons, highway bridges.

PENNSYLVANIA RAILROAD, 580 tons, bridges for Long Island Railroad in Corona, L. I.; bids in.

STATE OF NEW JERSEY, 600 tons of shapes and 1500 tons of sheet piling, pier bases, route 25, connecting link with sections 3 and 4; Arthur McMullen, Inc., New York, low bidder for general contract.

STATE OF NEW JERSEY, 100 tons, route 41, section 3, Mariton-Cooper Road; bids open April 21.

DEPEW, N. Y., 300 tons, New York Central grade crossing elimination.

PHILADELPHIA, 3000 tons, Ridge Avenue subway; former bids with Keystone State Corporation low, rejected.

PHILADELPHIA, 500 tons, junior high school, Eleventh and Catharine Streets; bids in.

WASHINGTON, 3200 tons, Department of Agriculture Building.

MOBILE, ALA., 3000 tons, Malbis Hotel.

YOUNGSTOWN, 1500 tons, theater for Warner Brothers.

MILWAUKEE, 6000 tons, Northwestern Mutual Life Building.

NEWARK, 125 tons, Chancellor Avenue school, to Igoe Brothers.

NEWARK, 125 tons, school, Ivy Street, to Joseph T. Ryerson & Son.

NEWARK, 100 tons, addition to Barringer High School, to Faitoute Iron & Steel Co.

PITTSBURGH, 100 tons, foundation for Gulf Refining building, to McClintic-Marshall Co.

TERRE HAUTE, IND., 1000 tons, building for American Can Co., to Joseph T. Ryerson & Son.

STATE OF INDIANA, 800 tons, road work, to several bidders.

CHICAGO, 150 tons, grain elevator for Pennsylvania Railroad, to Inland Steel Co.

CHICAGO, 3000 tons, buildings for American Can Co., to Joseph T. Ryerson & Son; previously reported to an unnamed bidder.

SEATTLE, 212 tons, east approach of West Spokane Street bridge, to Pacific Coast Steel Corporation.

SEATTLE, 130 tons, Graybar Building, to Pacific Coast Steel Corporation.

TACOMA, WASH., 1000 tons, Medical Arts Building, to Pacific Coast Steel Corporation.

Reinforcing Bars Pending

Inquiries for reinforcing steel bars include the following:

NEW YORK, 1500 tons, superstructure, West Street elevated highway, contract 5, section 1, division 1; general contract bids to be in April 3.

STATE OF NEW JERSEY, 2200 tons, pier bases, route 25, connecting link with sections 3 and 4; Arthur McMullen, Inc., New York, low bidder for general contract.

PHILADELPHIA, 900 tons, Ridge Avenue subway; former bids with Keystone State Corporation low, rejected.

PHILADELPHIA, 950 tons, junior high school, Eleventh and Catharine Streets; bids in.

WHITE SULPHUR SPRINGS, W. VA., 1000 tons, addition to Greenbrier Hotel.

CINCINNATI, 450 tons, Beachmont viaduct.

CLEVELAND, 1000 tons, Fulton Road bridge.

CLEVELAND, 1000 tons, piers for Central Lorain viaduct.

DAYTON, OHIO, 500 tons, building for Soldiers' Home.

LORAINE CITY, OHIO, 217 tons, sewer construction for Montgomery County commissioners.

SOUTH BEND, IND., 100 tons, addition to La Salle Hotel.

SPRINGFIELD, ILL., 1400 tons, State highway work; bids April 11.

OAK PARK, ILL., 100 tons, school.

GALESBURG, ILL., 2635 tons, sewage treating plant; first contract to be placed will call for 135 tons.

ST. LOUIS, 700 tons, Herbert Hadley Vocational School for St. Louis Board of Education.

SEATTLE, 2500 tons, concrete pier for American Can Co.; sub bids being taken.

SEATTLE, 225 tons, viaduct on West Spokane Street; bids April 4.

PEARL HARBOR, 1000 tons, pier for naval air station; general contract awarded.

Railroad Equipment

Large Orders for Passenger Equipment Placed

ALTHOUGH further large inquiries for freight cars are expected within a month, with the Illinois Central already having signified its intention of asking for prices on more than 2300 cars of various types, the equipment market during the past week has continued rather dull. However, orders were placed for a total of 755 cars and new inquiries appeared for 375 cars. Details of the week's business follow:

Chesapeake & Ohio, Pere Marquette and Hocking Valley have ordered a total of 91 passenger cars to cost $2,900,000 as follows: For Chesapeake & Ohio, 30 de luxe coaches to Pullman Car & Mfg. Corporation; 11 de luxe coaches to Standard Steel Car Co.; six mail and express to American Car & Foundry Co.; 15 baggage and passenger to Pressed Steel Car Co.; five passenger, baggage and mail to St. Louis Car Co. For Pere Marquette, eight de luxe coaches to Pullman Car & Mfg. Corporation; 12 baggage and express cars to American Car & Foundry Co. For Hocking Valley, four de luxe coaches to Standard Steel Car Co.

Gulf, Mobile & Northern has ordered 250 box cars from American Car & Foundry Co.

Louisiana & Arkansas has ordered 500 box cars from General American Car Corporation.

Southern Pacific has ordered five dining cars from Pullman Car & Mfg. Corporation.

General Electric Co. has ordered five flat cars from American Car & Foundry Co.

Orders are expected this week from the Reading for 70 passenger cars and from the Central of New Jersey for 25 passenger cars.

Northern Pacific closed bids Monday for 250 stock cars, which inquiry was recently sent out, and orders are expected shortly.

Bangor & Aroostook has ordered 200 underframes and superstructures from the Standard Steel Car Co. It recently ordered similar parts from the Pressed Steel Car Co., indicating that it will build 400 cars in its own shops.

Durham & Southern has ordered two locomotives from Baldwin Locomotive Works.

Akron & Barberton Belt has ordered four switching locomotives from Baldwin Locomotive Works.

Minneapolis & St. Louis may soon enter the market for 500 box cars.

Green Bay & Western is inquiring for 125 automobile cars.

Missouri-Kansas-Texas will buy 250 gondola cars.

Illinois Central will soon ask bids on nine oil-electric locomotives, 1000 furniture cars, 200 flat cars, 1000 open top cars, 15 mail and baggage cars, 15 passenger cars, 20 suburban cars, 65 cabooses, two rail motor cars and four dining cars.

Peoria & Pekin Union will buy two eight-wheel switching locomotives.

Union Tank Car Co. will rebuild 250 to 500 tank cars at Philadelphia and a like number at Whiting, Ill. Steel required will be three tons per car.

Central Railroad of New Jersey has awarded 10 small locomotives to the Baldwin Locomotive Works.

Reinforcing Steel

New Projects of 18,000 Tons Largest in Many Months

NEW projects in the past week reached a larger total than in any week this year, with more than 18,000 tons. Included were 2200 tons in a highway contract in New Jersey, 2500 tons for a concrete pier in Seattle, 2635 tons for a sewage treating plant in Galesburg, Ill., and 1500 tons in the superstructure of the New York West Side elevated highway. Awards totaling more than 4000 tons included 1000 tons for a building in Terre Haute, Ind., and 1000 tons in the Medical Arts building, Tacoma, Wash. Awards follow:

NEW YORK, 100 tons, bars for Empire State Building, to Concrete Steel Co.

SEWAREN, N. J., 100 tons, tank foundations for Shell Eastern Petroleum Corporation, to Igoe Brothers.

NEWARK, 200 tons, National Lock Washer Co. factory, to Igoe Brothers.

Sales of American Rolling Mill Co. and subsidiary companies for 1929 were valued at $70,434,232. Net earnings were $6,110,570, or $4.24 a share on common stock after providing for dividends on 6 per cent preferred stock. Total assets increased $8,000,000 during the year. Average number of common shares outstanding during the year was 1,400,000.

Rail Production Stabilized in 1929

Slight Increase Over 1928—Heaviest Sections Made New High Records—Small Alloy Tonnage

STEEL rails produced in the United States in 1929 are reported by the American Iron and Steel Institute at 2,722,138 gross tons, a gain of 74,645 tons, or 2.8 per cent, over 1928. The total was almost precisely the same as the average of the two years preceding (2,726,990 tons) and as the average of the seven years 1922-1928 (2,709,501 tons), departing less than ½ per cent from either.

New high records were made in the heavy sections. Rails weighing 120 lb. and more to the yard reached 834,605 tons, a gain of 16.2 per cent over the previous record, made in 1928. Rails of 100 lb. and over (including the 120-lb. group) for the first time exceeded 2,000,000 tons, reaching 2,068,204 tons. This shows a gain of 5.2 per cent over the 1,966,440 tons (previous record) of 1926, when the 120-lb. classification had not yet been made.

New low records were made in the lighter sections. Rails of 85 to 100 lb. produced the smallest total in several decades, being 12 per cent below 1928 and less than one-third of the corresponding tonnage of 1916. Those of 50 to 85 lb. declined 19 per cent from 1928, making the lowest total, probably, since the Civil War. Rails of below 50 lb. showed a gain of 5.4 per cent over 1928, but made otherwise the lowest total for which records are available.

Practically 76 per cent of all rails made last year were of 100 lb. or over. This ratio has shown a steady and large gain for a number of years, having been below 59 per cent as recently as 1925. Open-hearth steel was used for 97.80 per cent of the total tonnage—the highest ratio yet reached by this process.

Alloy-treated steel rails, at 1965 tons, made the smallest total (except for 1927) in more than 20 years. Most of the tonnage treated was in the heavier rails—748 tons of 85 to 100 lb.; 967 tons of 100 to 120-lb.; 150 tons of 120-lb. or over. The remaining 100 tons was in rails of under 50 lb.

Electric-steel rails reached 723 tons last year, compared with 438 tons in 1928. While this was the largest such tonnage since 1913, it represented only a fraction of the electric-steel rail output of either 1912 or 1913—3455 tons and 2436 tons respectively.

Rails rerolled from old steel rails made the smallest tonnage since these figures were first reported separately, which was for 1911 production. At 55,766 tons, the drop from 1928 was over 13 per cent, and the amount was less than one-half that of 1923. Adding rails rerolled from new seconds or defectives, a total of 66,532 tons of rerolled rails was produced last year.

PRODUCTION OF STEEL RAILS IN THE UNITED STATES
(In Gross Tons)

Weight per yard:	1929	1928	1927	1926	1925
120 lb. and over	834,605	718,428	617,524	1,966,440	1,636,631
100 lb. to 119 lb.	1,233,599	1,203,749	1,314,424		
85 lb. to 99 lb.	409,628	465,393	539,445	797,662	765,371
50 lb. to 84 lb.	102,944	125,726	173,257	256,287	219,648
Under 50 lb.	141,362	134,197	161,836	197,260	163,607
Total	2,722,138	2,647,493	2,806,486	3,217,649	2,785,257
Percentage, 100 lb. and over	75.98	72.61	68.84	61.12	58.76
Included above:					
Open-hearth	2,662,163	2,580,141	2,717,865	3,107,992	2,691,823
Bessemer	3,486(a)	2,718(a)	1,566(a)	12,533	9,687
Electric	723	438	0	0	0
Percentage, open-hearth	97.80	97.46	96.84	96.60	96.64
Rerolled from old rails	55,766(b)	64,196(b)	87,055(b)	97,124	83,747
Alloy-treated	1,965	6,453	1,265	4,216	4,009

(a) All under 50 lb.
(b) All under 100 lb.; more than 70 per cent under 50 lb.

Automotive Group Large Buyer of Machine Tools

(*Concluded from page* 992)

General Machinery Builders (not otherwise covered).—Twenty-four of the 40 companies credited sales to general machinery builders. As this classification permits of varying interpretations as to what sales should be so credited to it rather than to other more specific headings, the figures are to be viewed in the light of such possible variations. One company reports 30 per cent of its sales to this group, another 27 per cent, one 11.14 per cent, one 11 per cent, one 10.2 per cent, one 10 per cent, one 9 per cent, one 6 per cent, two 5 per cent, while the remaining 14 were under 5 per cent, but only one under 1 per cent.

Export.—Thirty of the 40 companies report having done export business. An additional company analyzed only its domestic sales, but commented that its export sales were equal to 25 per cent of its domestic business. Some companies did a substantial volume of export business, one reporting 29.7 per cent, one 27½ per cent, one 24.4 per cent, one 20½ per cent, two 20 per cent, one 19 per cent, one 17.64 per cent, one 16 per cent, one 15.74 per cent, one 15½ per cent, one 15 per cent, one 14½ per cent, one 13½ per cent, one 12½ per cent, one 12.2 per cent, one 9 per cent, one 8 per cent, one 7.01 per cent, one 6 per cent, four 5 per cent, while the remaining 6 did less than 5 per cent.

Miscellaneous (not covered by any of above classifications).—Twenty-four of the 40 companies listed some of their sales in the miscellaneous classification. Percentages varied widely, ranging from 42 per cent down to 1 per cent. A few companies, however, subdivided their miscellaneous sales into groupings not given in THE IRON AGE listing. Three companies reported sales to manual training schools, one company saying that 10 per cent of its business was with this group, while another did 4 per cent and the third did 3 per cent. It is interesting that typewriters, calculating machines, phonographs, office machines, etc., accounted for 6 per cent of one company's sales, while the same company did 7 per cent of its year's business with makers of screw machine products, 4 per cent with makers of ball bearings, clocks, sewing machines and firearms. Another company did 3 per cent of its business with manufacturers of cash registers, typewriters, sewing machines and guns as a group.

Steel Wages Under the 8-Hour Day

(*Concluded from page* 1009)

Because of the heat and mass of product and machinery involved in steel making the subject of hazard to the worker has always been of special interest in this industry. Moreover, the industry itself has for many years devoted such particular study and effort to guarding against the otherwise inevitable hazards of its operations and its success in increasing the safety of steel work has been so marked as to win the widespread approval of agencies interested in human welfare.

The question is pertinent, therefore, as to whether any factor involved in the change from the two- to the three-shift system or in the decreasing numbers of workers per unit of production is in any way tending to affect the hazard of steel work. The answer is very plain and is summarized in a recent report of the Bureau of Labor in its *Monthly Labor Review* for October, 1929, page 34, as shown in the table at the bottom of page 1009.

The Worcester, Mass., branch, National Metal Trades Association, at its annual meeting, March 19, elected the following officers: President, Albert C. Marble, Curtis & Marble Machine Co.; vice-president, Fred S. Morton, Matthews Mfg. Co.; secretary, Donald Tulloch; treasurer, William Arter, Arter Grinding Machine Co.

Poor Conditions in European Markets

Demand Slow and Uncertain and Prices Weak—Tin Plate a Lone Bright Spot—Steel Production in Germany Declining

(*By Cable*)

LONDON, ENGLAND, March 31.

FOLLOWING the recent reduction in Cleveland pig iron prices consumers have placed substantial orders and the general outlook is much improved.

Hematite iron prices are still weak, as competition between furnaces and merchants with stocks is unrestricted. Output exceeds demand and prices are expected to decline further, although they are even now less than cost.

Steel mill contracts booked prior to the last price advance are expiring and replacements being inadequate plants are operating irregularly. Export demand for heavy material is especially quiet. The market for Continental steel here is dull, consumers of semi-finished pressing for suspensions of deliveries, and new inquiry is small. Merchants are still uncertain of their position under the new ruling of the Continental Steel Cartel. Continental mills are reported in need of orders.

Revival of tin plate demand has been stimulated by the firmer tone of the tin market and orders have been placed for shipment several months forward.

Galvanized sheets are quiet and there is no indication of a substantial demand developing. Black sheets are also inactive.

Brown Bayley's Steel Works, Ltd., Sheffield, secured the second order for stainless steel chain 500 ft. in length supporting the dome of St. Paul's Cathedral. W. Gilbertson & Co., Ltd., is starting operation at Pontardawe of its new steel furnace, which has a capacity of more than 1000 tons a week. The English Steel Corporation has secured an order from the Continent for 74 forged steel boiler drums and a large contract for turbine rotors, involving the production of 5000 tons of steel ingots.

The British Guest, Keen, Baldwins Iron & Steel Co. has been registered with a nominal capital of £100 to acquire certain interests of Guest, Keen & Nettlefolds, Ltd., and Baldwins, Ltd.

Belgian output in February was 315,000 tons of pig iron, 311,000 tons of steel ingots and 271,000 tons of finished steel. German output in February was 1,176,000 tons of steel ingots and 798,000 tons of rolled steel. French output in February was 810,000 tons of pig iron and 773,000 tons of steel ingots. There were 154 French furnaces in blast at the end of February.

Coal Bill May Increase British Steel Costs

LONDON, ENGLAND, March 19.—Continued dullness in iron and steel reflects conditions in the general trade of the country. Iron and steel sales are undoubtedly affected by the maintenance of prices at high levels, causing consumers to buy no more than necessary for immediate needs, but steel producers are faced with a possible increase in the cost of fuel under the Coal Bill. An amendment was introduced into the House of Commons to exclude from the bill coal supplied to the iron and steel industry, but it was not adopted.

During the debate on the proposal it was disclosed that, under the bill, coal would probably advance 1s. 6d. (36c.) a ton, which would result in a probable increase in the cost of steel of 4s. 6d. ($1.09) a ton.

Heavy steel mills are in need of orders, especially for plates and shapes, export demand for which is small. There has been a slight improvement in shipbuilding. A contract for the Anglo-Saxon Petroleum Co. calls for 20 tankers of 11,500 tons each, to cost more than £3,600,000. Only eight of these vessels, however, will be built in British yards. The Cunard Line announces that it will place a contract for the world's largest liner, construction of which will require about three years.

Steel Output Declines—New Export Rebates

(*By Radio*)

BERLIN, GERMANY, March 31.

THE pig iron market is inactive and export prices have declined as a result of concessions in price granted by British sellers and activity of the recently renewed West European Pig Iron Entente.

Steel production in Germany is declining and rolling mills are reducing the number of shifts operated. Domestic steel prices, however, are unchanged. Demand for steel bars is especially small with the machinery

British and Continental European Export Prices per gross ton, f.o.b. United Kingdom Ports, Hamburg and Antwerp, with the £ at $4.8665 (par)

British Prices f.o.b. United Kingdom Ports

Ferromanganese, export	£10	15s.	to	£11	15s.	$52.30	to	$57.17
Billets, open-hearth	6	2½	to	6	12½	29.81	to	32.24
Black sheets, Japanese specifications	12	5				59.61		
Tin plate, per base box	0	18¼	to	0	18¾	4.43	to	4.55
						Cents a Lb.		
Steel bars, open-hearth	8	0	to	8	10	1.74	to	1.85
Beams, open-hearth	7	7½	to	7	17½	1.60	to	1.71
Channels, open-hearth	7	12½	to	8	12½	1.66	to	1.87
Angles, open-hearth	7	7½	to	7	17½	1.60	to	1.71
Black sheets, No. 24 gage	9	15	to	10	0	2.12	to	2.17
Galvanized sheets, No. 24 gage	11	17½	to	12	5	2.57	to	2.60

Continental Prices, f.o.b. Antwerp or Hamburg

Foundry iron, 2.50 to 3.00 per cent sil., 1.00 per cent and more phos.	£3	3½s.	to	£3	4½s.	$15.44	to	$15.69
Billets, Thomas	4	13	to	4	14	22.63	to	22.87
Wire rods, low C., No. 6 B.W.G.	6	2	to	6	4	29.69	to	30.19
Rails, light	6	0				29.20		
						Cents a Lb.		
Steel bars, merchant	5	7½				1.18		
Steel bars, deformed	5	6½	to	5	7½	1.17	to	1.18
Beams, Thomas, British standard	5	3	to	5	6	1.12	to	1.17
Channels, Thomas, American sections	5	12	to	5	14	1.24	to	1.26
Angles, Thomas, 4-in. and larger, over ⅝-in. thick	5	6				1.17		
Angles, Thomas, 3-in.	5	7½				1.18		
Black sheets, No. 31 gage, Japanese	12	1	to	12	3	2.66	to	2.68
Hoop and strip steel over 6-in. base	5	17½				1.28		
Wire, plain, No. 8 gage	6	10	to	6	17½	1.42	to	1.50
Wire, barbed, 4-pt. No. 12 B.W.G.	10	15				2.33		
Wire nails, base	6	15				$1.47 a keg		

builders inactive. Importation of foreign bands is increasing.

The usual spring improvement in the wire market has not yet appeared. Prospects of increased business in the wire export market are improved based on the expectation that the International Wire Cartel will be renewed.

The domestic prices of the German Tube Syndicate are being shaded by traders with old stocks on hand. Export of semi-finished steel has revived slightly. For April, the Ingot Steel Syndicate has reduced its price rebates to exporting manufacturers on steel bars and structural shapes and increased the refunds on slabs. Rebates on other products are unchanged.

American Tungsten Users Not to Buy Cooperatively

HAMBURG, GERMANY, March 15.—As recently reported, European consumers of tungsten ore are buying cooperatively. Since organizing they have invited the leading American users of tungsten ore to join them, but have received the reply that at present American consumers do not wish to participate in a cooperative buying movement.

Many German Stacks to Be Dismantled

HAMBURG, GERMANY, March 15.—At the end of February there was a total of 182 blast furnaces in Germany, of which 93 were in blast, 21 out for minor repairs, 46 undergoing extensive alteration or awaiting dismantling and 22 ready to be blown in. Pig iron production in February was 964,517 metric tons, compared with 1,082,206 tons in January.

Japan's Galvanized Sheet Exports Increasing

YOKOHAMA, JAPAN, Feb. 26.—Japan's exports of galvanized sheets in 1929 totaled 45,590 tons. Compared with exports in 1928 this is an increase of 10,146 tons. Of the total tonnage of 45,590 tons of sheets shipped, China received 11,339 tons, Kwantung Province 8277 tons, Siam 9952 tons, Dutch East Indies 9495 tons, Hongkong 2092 tons, Asiatic Russia 1029 tons, and all other countries, including the Philippines, British India and the Straits Settlements, 3406 tons.

Rustless Steel Exports Rise

ESSEN, GERMANY, March 15.—Exports of stainless and rustless steel products are expanding rapidly and include tubes, large containers and steel drums for breweries and chemical plants, hinges and straps, chain, wire, pens and cutlery.

Germany Invades Indian Market

Increases Machinery Sales 50 Per Cent While British Trade Declines 8 Per Cent—American Sales Also Smaller

WASHINGTON, March 24.—That the Indian market for industrial machinery is continuing at a high level is indicated by imports in the last nine months of 1929, which totaled $38,358,000. While this was a decrease of 4 per cent, compared with the corresponding period of 1928, it was a gain of nearly 14 per cent compared with the same period of 1927, according to the Industrial Machinery Division of the Department of Commerce. The total includes all machinery imported by India, except electrical, agricultural, sewing and printing equipment.

The principal classes of industrial machinery entering India, in the order of their importance, have been as follows: textile and mining machinery, oil engines and parts, boilers, steam engines and parts, oil cracking and refining machinery and metal working equipment.

For a period of years the leading suppliers have been the United Kingdom, the United States and Germany, with the United Kingdom far in the lead. Preliminary figures for the last nine months of 1929 show that imports from the United Kingdom decreased nearly 8 per cent, while imports from Germany showed an increase of about 50 per cent over the corresponding period of 1928 and nearly 87 per cent over the 1927 figure. Shipments from the United States were 14 per cent lower than in the corresponding period in 1928, but 10 per cent larger than in 1927.

The largest portion of the American machinery trade with India is in mining equipment for use in the coal, manganese and gold mines of the country. Other leading shipments from the United States to India were refrigeration machinery, oil cracking and refining, metal working, cotton and jute machinery. Construction and excavating machinery is not separately classified by the Indian customs, but it is known that much American equipment of this type has been used on the large irrigation projects, notably the Sukkur or Lloyd Barrage. The magnitude of the Lloyd Barrage is indicated by the fact that at the end of September, 1929, earth removed by excavating machinery and manual labor was equivalent to a channel 280 miles long, 200 ft. wide and 10 ft. deep.

Merchant Marine to Be Subject of Conference

WASHINGTON, April 1.—The Shipping Board has announced that the third national conference on the merchant marine will be held at the United States Chamber of Commerce in Washington on April 23 and 24. Among the subjects to be discussed are reduction of differentials between shipbuilding costs here and abroad; methods of increasing patronage for American ships; mail contracts; Government aid to American ships not benefited by mail contracts; construction program under the Jones-White Act; cooperation between shippers and ship operators in the use of American ships; relation of American railroads to the American merchant marine; marine engineering developments and research.

German Ford Plant Started

COLOGNE, GERMANY, March 13.—Construction of a Ford Motor Co. plant in this city has been started. The plant is expected to be in operation early in 1931, and about 85 per cent of the output will represent German materials and labor.

German Foreign Trade in Iron and Steel Products
(In Metric Tons)

Item	Imports		Exports	
	January	February	January	February
Pig iron and ferroalloys	22,004	13,597	33,153	24,271
Ingots, blooms and billets	9,754	9,435	62,581	36,906
Iron and steel bars, rods, angles	43,718	35,174	119,518	83,445
Structural shapes	100	353	9,434	10,948
Hoops and bands	6,424	6,980	14,779	13,898
Plates and sheets	6,008	7,248	54,131	44,722
Galvanized sheets	179	16	2,149	2,239
Tin plate	1,823	1,713	4,010	2,568
Cast iron pipe	3,289	5,107	9,377	10,355
Wrought iron pipe	261	700	29,272	23,752
Pipe fittings	63	147	4,721	4,743
Rails	6,969	5,605	32,216	29,712
Other railroad material	536	832	6,531	9,320
Plain wire	7,226	7,626	30,239	28,627
Barbed wire	193	362	4,961	3,423
Wire rope	93	25	1,779	1,352
Wire cloth	4	4	2,994	1,688
Other wire manufactures	36	32	785	775
Nails, tacks, rivets and washers	119	413	9,491	8,921
Castings and forgings	1,378	2,373	22,835	28,923
All other	562	778	4,726	4,598
Total	110,739	98,520	459,682	375,186

Machinery Exports Continue Impressive

Sixth Largest Month Ever Reported—Shipments of Agricultural Machinery Make New Record—Imports Above January

WASHINGTON, March 28.—Totaling $52,517,811, exports of machinery of all kinds in February showed a decline of $3,835,096 from the January figure of $56,352,907 but an increase of $6,097,984 from the February, 1929, total of $46,419,827. For the first two months these exports rose to $113,861,467 from $95,326,014 for the like period of 1929, a gain of $18,535,453, or approximately 19 per cent. Despite the sharp drop from January, the February total is the sixth largest ever reported for any month.

Exports of machinery and vehicles in February aggregated $91,342,983, an increase of $2,478,879 over those in January, valued at $88,864,104. On the other hand, the February shipments were less by $20,163,282 than the February, 1929, total of $111,506,265. For the first two months the total was $180,207,836 in 1930, compared with $211,378,833 last year.

Exports of agricultural implements in February rose to the formidable figure of $21,272,477, which apparently set the highest monthly record ever made. They reflected a gain of 100 per cent over February, 1929, shipments, valued at $10,520,944. The heavy movement was due in substantial degree to the large shipments of tractors to Russia.

Figures of the Division of Statistics, Department of Commerce, show exportation of industrial machinery to the value of $20,739,801 in February, compared with $24,590,055 in January and $20,690,338 in February of last year. For the first two months industrial machinery exports were valued at $45,330,605, against $42,728,123 last year.

Exports of power-driven metal-working machinery in February were valued at $2,930,211, against $3,215,109 in January and $2,554,299 in February of last year. For the two months of 1930 this class of exports was valued at $6,145,320, compared with $5,097,753 last year.

Exports in February of power-driven metal-working machinery reported in THE IRON AGE table numbered 889 units, valued at $1,539,846. Exports in January were 1223 units, valued at $1,641,621.

Imports Gain Over January

Imports of machinery and vehicles in February were valued at $3,401,892, compared with $3,163,596 in the preceding month and $3,519,101 in February of last year. For the first two months they were valued at $6,564,488, against $6,410,498 for the corresponding period of last year. Imports listed in THE IRON AGE table showed a value of $2,740,206 in February, against $2,506,749 in January and $2,837,966 in February of last year. For January and February they were valued at $4,995,690, against $5,027,141 for the corresponding period of last year.

Imports of industrial, office and printing machinery in February were valued at $1,413,602, compared with $2,113,268 in January and $2,094,096 in February of last year. For the first two months of 1930 they were valued at $3,526,870, against $3,939,048 for the same period of 1929.

Machinery Exports from the United States

(By Value, in Thousands of Dollars)

	February		Two Months Ended February	
	1930	1929	1930	1929
Locomotives	$63	$224	$83	$552
Other steam engines	12	61	68	157
Boilers	105	149	327	288
Accessories and parts	53	160	131	222
Automobile engines	968	1,238	1,262	2,096
Other internal combustion engines	339	689	806	1,528
Accessories and parts	53	381	131	674
Electric locomotives	93	79	178	187
Other electric machinery and apparatus	905	790	1,976	1,776
Excavating machinery	737	422	1,830	940
Concrete mixers	65	203	158	274
Road-making machinery	250	203	294	387
Elevators and elevator machinery	476	435	1,121	869
Mining and quarrying machinery	1,438	1,252	3,251	2,591
Oil-well machinery	3,494	1,779	6,168	3,663
Pumps	817	926	1,844	1,849
Sheet and plate working machines	251	269	532	505
*Machine tools	1,819	1,488	3,703	2,953
Forging machinery	159	99	443	163
Other metal-working machinery and parts	582	586	1,228	1,172
Textile machinery	716	1,095	1,755	2,214
Sewing machines	736	943	1,465	1,821
Shoe machinery	138	187	297	392
Flour-mill and gristmill machinery	20	73	41	150
Sugar-mill machinery	57	135	318	279
Paper and pulp-mill mach'ry	330	176	567	461
Sawmill machinery	80	72	190	142
Other woodworking machinery	99	141	340	329
Refrigerating and ice-making machinery	317	737	647	1,647
Air compressors	560	637	1,215	1,285
Typewriters	1,704	1,940	3,911	3,950
Power laundry machinery	205	109	330	329
Typesetting machines	341	617	697	1,229
Printing presses	311	665	830	1,227
Agricultural machinery and implements	21,272	10,531	34,966	22,951
All other machinery and parts	12,953	16,929	40,758	34,074
Total	$52,518	$46,420	$113,861	$95,326

*Principal details are shown in another table.

Imports of Machinery into the United States

(By Value)

	February		Two Months Ended February	
	1930	1929	1930	1929
Metal-working machine tools	$102,167	$105,313	$266,372	$185,121
Agricultural machinery and implements	1,706,713	953,127	2,418,223	1,366,794
Electrical machinery and apparatus	95,598	163,555	250,047	339,845
Other power-generating machinery	5,132	33,178	90,176	98,138
Other machinery	644,617	1,274,470	1,601,530	2,272,432
Automobiles and other vehicles, except agricultural	185,979	308,323	369,348	764,811
Total	$2,740,206	$2,837,966	$4,995,696	$5,027,141

Exports of Power-Driven Metal-Working Machinery

	February, 1930		January, 1930	
	No.	Value	No.	Value
Engine lathes	95	$209,961	58	$98,240
Turret lathes	34	111,568	32	56,779
Other lathes	*	100,151	93	95,606
Vertical boring mills and chucking machines	24	58,661	27	77,950
Thread-cutting and automatic screw machines	69	105,254	90	137,504
Knee and column-type milling machines	27	57,456	44	118,334
Other milling machines	51	76,514	125	363,303
Gear-cutting machines	20	94,532	42	74,768
Vertical drilling machines	119	97,814	51	96,699
Radial drilling machines	11	20,950	3	10,917
Other drilling machines	187	229,197	281	80,246
Planers and shapers	16	30,911	45	102,998
External cylindrical grinding machines	33	76,020	51	147,970
Internal grinding machines	89	200,507	26	77,552
Metal-working tool-sharpening machines	114	70,350	224	102,754
Total	*889	$1,539,846	1,223	$1,641,621

*The number of "other lathes" exported in February obviously was reported erroneously and consequently is omitted.

Machinery Markets and News of the Works

Russian Company Largest Buyer

Amtorg Trading Corporation Orders 35 Turret Lathes for Tractor Plant

UNCERTAINTY as to the general business trend over the next few months continues to act as a check on machine tool purchases. In certain instances there have been gains in sales, but the movement has not been widespread enough to indicate that a broad upturn is imminent.

With respect to the large volume of business that is overhanging the market, the situation is unchanged. Many manufacturers say they need the equipment they have inquired for and will buy it as soon as the signal to go ahead is received from boards of directors or other executives.

Despite these promising prospects, the general report from machine tool selling centers is of dullness, but comparisons are naturally being made with the high level of activity of last year. In the Chicago territory, the heavy snows of the past week interfered with business.

The Amtorg Trading Corporation, New York, continues as one of the most active buyers in the market. One of its orders of the past week was for 35 turret lathes for the Stalingrad tractor plant. An order for 12 boring machines, reported a week ago as having been awarded to a Massachusetts company, is said to be still open.

Equipment of the F. B. Stearns Co.'s automobile plant in Cleveland, numbering several hundred tools, will be offered at auction April 8-10.

New York

NEW YORK, April 1.—While the machine tool situation has not changed materially for a large portion of the trade, one of the larger distributers reports a substantial gain in orders the past week. This was the result of the closing of certain business that had been pending for some time. Inquiries are fairly numerous, but companies are slow to take action in view of some uncertainty as to the general business trend.

General Cable Co., 420 Lexington Avenue, New York, has awarded general contract to Public Service Production Co., 80 Park Place, Newark, for one-story addition to plant at Perth Amboy, N. J., for Standard Underground Cable Co. division, to cost over $100,000 with equipment. Unit will be used primarily for production of rubber-covered wire.

Rockland Light & Power Co., North Broadway, Nyack, N. Y., has plans for new power plant on Delaware River, near Port Jervis, N. Y., to cost about $1,750,000 with transmission system. Charles T. Main, Inc., 201 Devonshire Street, Boston, is consulting engineer. Company is operated by Charles H. Tenney & Co., 38 Chauncy Street, Boston, who will supervise construction.

General Baking Co., 420 Lexington Avenue, New York, has arranged for a bond issue of $7,000,000, part of fund to be used for expansion and improvements in plants in different parts of country. Plans are said to be under way for new plant at Detroit, with ovens, power equipment, conveying and other machinery to cost more than $750,000.

Standard Concrete Steel Co., 250 Eighth Avenue, New York, has plans for a two-story storage and distributing plant, 75 x 100 ft., to cost about $45,000 with equipment.

Officials of American Cyanamid Co., 535 Fifth Avenue, New York, have organized Catalytic Process Corporation, a subsidiary, to take over and expand sulphuric acid properties of parent company, including Calco Chemical Co., Bound Brook, N. J., which has work under way on additions to plant, and Selden Co., 339 Second Avenue, Pittsburgh. M. C. Whitaker is president of new organization, and W. P. Sturtevant, secretary.

Board of Education, Albany, N. Y., is planning installation of manual training equipment in new Arbor Hill junior high school to cost over $1,300,000, for which bids are being received on general contract until April 7. A. L. Delehanty, 121 North Pearl Street, is architect.

Springfield Body Works, Wildey Street, Tarrytown, N. Y., manufacturer of automobile bodies, is planning early occupancy of new one-story plant unit, now nearing completion, to cost about $30,000 with equipment.

Bakelite Corporation, 247 Park Avenue, New York, manufacturer of rubberized insulating products, has awarded general contract to J. W. Ferguson Co., Inc., 152 Market Street, Paterson, N. J., for three-story addition to plant at Bloomfield, N. J., 54 x 154 ft., to cost over $100,000 with equipment. Robert Bolton, 45 Branford Place, Newark, is architect.

Texas Co., 17 Battery Place, New York, will soon begin construction of new oil storage and distributing plant at Ossining, N. Y., to cost about $200,000 with equipment.

Westinghouse Electric & Mfg. Co., 150 Broadway, New York, has taken out a permit for one-story steam power plant at new factory branch at Newark, to cost about $40,000 with equipment.

Public Service Electric & Gas Co., 80 Park Place, Newark, has plans for a new power substation at Elizabeth, N. J., to cost $475,000 with equipment. Work will also proceed on similar plant at Hopelawn, near Keasbey, N. J., to cost about $210,000 with equipment.

L. S. Brach Mfg. Corporation, 129 Sussex Avenue, Newark, manufacturer of electrical clocks and devices, radio equipment, etc., has leased part of former plant of Rochester Button Co., 51-63 Dickerson Street, two stories and basement. Present works will be removed to new location and capacity increased. Brach company recently sold its railroad signal manufacturing division and will concentrate on lines noted at new plant. Rochester company has closed down Newark factory and will consolidate all production at plant at Rochester, N. Y.

Board of Passaic County Freeholders, Paterson, N. J., has authorized purchase of site in Lower Preakness for County airport, including hangars, storage, repair and reconditioning units, and other field structures, to cost over $100,000 with equipment.

In connection with expansion under way at plant of Core Joint Pipe Co., Union Township, N. J., including installation of equipment for manufacture of concrete pipe sections from 6 to 18 in., company is planning further enlargements during next three to four months for production of pipe up to 48 in. diameter, and will install additional equipment.

Newark Air Service, Newark Airport, Newark, is planning to rebuild hangar with repair and reconditioning facilities, recently destroyed by fire. Major Robert L. Copsey is general manager.

Board of Education, Perth Amboy, N. J., has authorized installation of manual training department in addition to high school, to cost over $175,000, for

which bids are being asked on general contract until April 11. Ingvard Greisen, 175 Smith Street, is architect.

A recent item in THE IRON AGE incorrectly stated that the Alloys Foundry Corporation, West Paterson, N. J., was incorporated with $25,000 capital stock. This should have read 25,000 shares of stock.

South Atlantic

BALTIMORE, March 31.—Washington Railway & Electric Co., Fourteenth and C Streets, Washington, will take bids on general contract about middle of April for two-story automobile service, repair and garage building, to cost about $350,000 with equipment. A. B. Heaton, 1211 Connecticut Avenue, N. W., is architect.

Sturdy Electric Tools, Inc, care of Ashton B. Taylor, Petersburg, Va., recently organized by Mr. Taylor and associates with capital of $500,000, is considering construction of one-story plant at Richmond, Va., to cost over $50,000 with equipment, specializing in manufacture of electric tools.

American Can Co., 230 Park Avenue, New York, has acquired property at Richmond, Va., and will use for later expansion of present local factory unit, Church Hill district to cost about $1,000,000.

Seaboard Air Line Railway, Savannah, Ga., is planning to rebuild part of locomotive repair shops at Monroe, N. C., destroyed by fire March 24, with loss over $40,000 with equipment. Company has been arranging expansion program at these shops and has recently let general contract to Wadesboro Construction Co., Wadesboro, N. C., for new engine house and repair shop, to cost about $50,000 with equipment. W. D. Faucette, Savannah, is chief engineer.

Carlisle Veneer Co., Evergreen, Ala., has authorized immediate construction of a new veneer mill at Riceboro, near Ludowici, Ga., to cost about $100,000 with machinery, which will be electrically operated.

Albemarle-Chesapeake Co., Inc., West Point, Va., has arranged for bond issue of $500,000, fund to be used for construction of new local paper mill, now in progress. Plant will be equipped for production of kraft papers and board, and will cost over $1,000,000 with machinery.

Firestone Tire & Rubber Co., Akron, Ohio, will take bids early in April for three-story factory branch, storage, distributing and service plant at Baltimore, to cost over $175,000 with equipment.

Enterprise Ice & Mfg. Co., Burton, S. C., is considering one-story addition to ice-manufacturing and cold storage plant, including improvements in present unit, reported to cost over $40,000 with equipment.

Atmospheric Nitrogen Co., Hopewell, Va., is planning construction of second operating unit at local plant for production of ammonia, nitrates, etc., to cost more than $15,000,000 with machinery. Stone & Webster Engineering Co., 49 Federal Street, Boston, and 120 Broadway, New York, is engineer. Company is an interest of Allied Chemical & Dye Corporation, 61 Broadway, New York.

School Board, Columbus, Ga., is receiving bids on general contract for one and two-story and basement vocational school for negroes, to cost about $80,000 with equipment. Smith & Biggers, Murrah Building, are architects.

Central Public Service Co., operating Roanoke Gas & Light Co., Roanoke, Va., and other electric and gas power properties, is planning construction of pipe line for natural gas service at Blacksburg, Athens, Va., and vicinity, securing supply in Bozoo Fields of West Virginia, to cost over $150,000 with compressing stations and other equipment.

The Crane Market

INQUIRY for locomotive cranes is increasing, with contractors and the railroads beginning to show more interest in buying. The Pennsylvania Railroad has not yet closed on a large list of 8-ton crawl-tread cranes, its purchases of which for the year are expected to total 50 or more. Railroads are also showing interest in small, standard gage locomotive cranes of 6½ to 7 tons capacity, self-propelled at 15 miles an hour or more. The Guarantee Construction Co., New York, has closed on two 25-ton locomotive cranes with the Ohio Locomotive Crane Co. The General Electric Co., Schenectady, N. Y., is in the market for a 50-ton, standard gage locomotive crane with 70 to 90-ft. boom.

New inquiry for overhead traveling cranes has not been large in the past week, but there is considerable active business pending, including one list of 10 cranes for the Anglo-Chilean Consolidated Nitrate Corporation, New York. In addition to its locomotive cranes for export to Russia, the Amtorg Trading Corporation, New York, is inquiring for some special gantry-type cranes. The Ontario Paper Co., Thorold, Ont., has closed on two special electric hammerhead cranes with the Orton Crane & Shovel Co. The Baltimore & Ohio Railroad has closed on two 50-ton cranes, the New York, New Haven & Hartford Railroad a 35-ton crane and the Boston & Albany a 20-ton overhead crane, all with the Milwaukee Electric Crane & Mfg. Corporation.

Philadelphia

PHILADELPHIA, March 31.—Edwin A. France, 6736 State Road, Philadelphia, manufacturer of metallic packing, etc., has awarded general contract to Stewart Brothers Co., 2526 Orkney Street, for a one-story machine shop, to cost about $25,000 with equipment.

Great Atlantic & Pacific Tea Co., 420 Lexington Avenue, New York, has taken over two-story building, 100 x 300 ft., to be erected at Oregon Avenue and Swanson Street, Philadelphia, for storage and distributing plant, with cold storage and refrigerating division, installation of conveying, elevating and other mechanical-handling equipment, to cost about $200,000 with machinery. General contract has been let to Potash Brothers, Philadelphia; Herman Kline, 709 Chestnut Street, is architect.

Farman Aircraft Corporation, recently organized, operated by H. & M. Farman, Atlantic Building, Philadelphia, has acquired Souther Field, Americus, Ga., as site for new airplane plant, including parts and assembling divisions, for production of large Pullman type of trimotor aircraft. Several existing hangars and buildings will be remodeled and improved, and new units constructed. Entire project will cost over $400,000 with equipment.

Chicago Tubing & Braiding Co., 216 North Clinton Street, Chicago, has leased space in factory at Moyamensing Avenue and Pierce Street, Philadelphia, for new Eastern factory branch and distributing plant.

T. J. Cope, Inc., Philadelphia, has been formed with a capital of $50,000 to take over and expand business heretofore operated under name of T. J. Cope, 6120 Vine Street, manufacturer of electrical equipment. New company will manufacture tools, devices and other mechanical specialties in addition to electrical apparatus. William H. Govatt, Aldan, Pa., has been elected treasurer; Edgar W. Baird, 7800 Navahoe Street, will be an official of new company.

Overhead Door Sales Co., 1526 Vine Street, Philadelphia, garage doors, etc., has leased two-story building at 3430 Lancaster Avenue, for new factory branch, storage and distributing plant.

Captain Anton F. Heinen, 11 Seward Avenue, Toms River, N. J., and associates have organized Heinen Air Yacht Corporation, with capital of 1000 shares of stock, no par value, to establish aircraft mnaufacturing plant on property recently leased from City Commission at Atlantic City, N. J., specializing in production of large type multi-passenger airplanes, with parts and assembling departments. Same interests have also formed Heimen Airport, Inc., with capital of 100 shares of stock, no par value, to construct airport on adjoining site, with hangars, repair shops and other units. Work will begin at once. Louis Matzhold and Henry H. McAlees, both of Toms River, are interested in new companies.

York Hoover Body Corporation, Belvidere and Linden Streets, York, Pa., manufacturer of automobile bodies, will soon take bids on general contract for two-story plant, to cost about $40,000 with equipment. W. H. Swartz, 515 Prospect Street, is architect.

Department of Property and Supplies, State House, Harrisburg, Pa., is asking bids until April 16 for a 10-ton crane for coal-handling at State Hospital at Danville, Pa., in conjunction with other mechanical equipment, for which plans and specifications have been prepared by Albright & Mebus, 1502 Locust Street, Philadelphia, engineers.

Ridge Avenue Auto Wrecking Co., Philadelphia, has leased three-story factory at 1024-28 Ridge Avenue, for plant for auto parts salvaging, distributing and storage service.

Chamber of Commerce, Scranton, Pa., is arranging for fund of $250,000 for municipal airport, including hangars, repair and reconditioning shops, and other field units.

Buffalo

BUFFALO, March 31.—Fetter Steel Barrel Corporation, 36 Lansing Street, Buffalo, manufacturer of steel barrels, drums and kindred plate products, has filed plans for new one-story plant, to cost about $40,000 with equipment.

Kimberly-Clark Corporation, Niagara Falls, N. Y., manufacturer of paper, has awarded general contract to Wright & Kremers, Inc., Pine Avenue and Main Street, for five-story addition, 85 x 200 ft., to cost about $200,000 with machinery. Headquarters of company are at Neenah, Wis.

International Graphite & Electrode Corporation, Niagara Falls, N. Y., care of W. A. Harty, 305 Woodbridge Avenue, Buffalo, president, recently formed by Mr. Harty and associates, has awarded contract to Pittsburgh Bridge & Iron Co.,

Bessemer Building, Pittsburgh, for one-story plant, 115 x 190 ft., to cost over $100,000 with equipment. Company is capitalized at $250,000. E. Ray Speare, 61 Montvale Road, Newton Centre, Boston, will be an official of new organization.

Worcester Salt Co., 71 Murray Street, New York, has awarded a general contract to John W. Ferguson Co., 152 Market Street, Paterson, N. J., for new one-story plant at Silver Springs, N. Y., 131 x 212 ft., to cost over $150,000 with equipment.

Empire Gas & Electric Co., Geneva, N. Y., plans extensions and improvements in hydroelectric power plant at Seneca Mills, N. Y., including installation of water wheel and other equipment. Company will also rebuild power transmission line from Phelps and Clifton Springs, N. Y., for heavy service, to cost over $50,000.

New England

BOSTON, March 31.—Universal Boring Machine Co., Hudson, Mass., anonymously referred to in THE IRON AGE last week as having received an order for 12 boring machines from Amtorg Trading Corporation, says that it has not yet received such an order. Company further says that the statement that it is 14 weeks behind on deliveries gives a wrong impression and that what should have been said is that its output is sold for 14 weeks ahead.

Board of Trustees, Harvard University, Cambridge, Mass., has asked bids on general contract for one-story power plant, 75 x 100 ft., at Harvard Medical School, Brighton, to cost over $80,000 with equipment. Densmore, LeClear & Robbins, Park Square Building, Boston, are architects and engineers.

Allen Mfg. & Electrical Corporation, Lawrence, Mass., which recently removed radio tube and equipment works from Newark, N. J., to a local plant, has acquired radio tube manufacturing division of Pilot Tube & Radio Corporation, with plant at Lawrence lately removed from Brooklyn, and latter's subsidiary, Detroit Radio Tube Products Corporation, Detroit, and will consolidate, expanding output for radio tubes of all kinds. Detroit Radio company has likewise removed to Lawrence, where production will be concentrated. Pilot Tube company will continue local plant for manufacture of radio receiving sets and television equipment.

United Electric Light Co., 73 State Street, Springfield, Mass., has plans for a one-story power substation, 85 x 185 ft., to cost over $100,000 with equipment. McClintock & Craig, 458 Bridge Street, are architects.

B. F. Sturtevant Co., 89 Broad Street, Boston, manufacturer of mechanical draft equipment, blowers, etc., with main plant at Hyde Park, has purchased property at Berkeley, Cal., and contemplates early construction of branch plant.

Berkshire Automobile Co., South Street, Pittsfield, Mass., is asking bids on general contract until April 7 for a two-story service, repair and garage building, 60 x 200 ft., to cost more than $100,000 with equipment. G. E. Haynes, 27 George Street, is architect.

New Departure Mfg. Co., Bristol, Conn., manufacturer of ball bearings, steel balls, etc., has awarded general contract to H. Wales Lines Co., Meriden, Conn., for additions to plant at Elmwood, including improvements in present units, to cost over $85,000 with equipment.

Adams & Hillyer, Inc., New London, Conn., automobiles, is planning construction of a one-story forge and blacksmith shop, and woodworking plant, primarily for automobile body repairs and construction, a new department of business now being organized. An existing building on site will be enlarged for machine shop.

New Hampshire Gas & Electric Co., Portsmouth, N. H., has acquired plant and property of Derry Electric Co., Derry, N. H., for $547,950, and will consolidate. Extensions are planned in last-noted district, including transmission lines.

Heppenstall Forge Co., Bridgeport, Conn., has awarded a contract for a crane runway to cost $50,000.

Bethlehem Shipbuilding Corporation, Quincy, Mass., closed bids March 28 on a one-story bolt and rivet shop addition.

City of Meriden, Conn., will have plans ready about April 30 for a two-story trade school, 75 x 208 ft., with two wings, 50 x 50 ft., to cost $155,000 without equipment.

Southern New England Ice Co., Hartford, Conn., has plans for a one-story ice-manufacturing plant, to cost $50,000 without equipment.

New York, New Haven & Hartford Railroad has plans for a coal discharging plant at Providence, R. I., to replace one recently destroyed by fire. Coal-handling cranes will be purchased, and machine shop equipment is under consideration.

Milwaukee

MILWAUKEE, March 31.—The continued quiet business of the automotive industries tends to restrict the volume of machine tool orders, but in general March totals represent an improvement, while prospects for April are more favorable. That considerable business is accumulating, awaiting release when production requirements become more substantial, is indicated by the increase in inquiries.

Austin Co., Cleveland, has general contract for a new machine shop and assembling floor, 150 x 200 ft., for Trackson division of George H. Smith Steel Casting Co., 500 Clinton Street, Milwaukee, as the first unit of a new shop group at Holt and Chase Avenues. Trackson division manufactures crawler attachments for tractors and has developed a complete line of contractors' equipment for tractor mounting.

Chicago & North Western Railway Co., 400 West Madison Street, Chicago, has announced intention of adding 48 additional units to Kinnickinnic elevator at Milwaukee, operated by Donahue-Stratton Co., Chamber of Commerce, at cost of $700,000, including additional grain-handling and drying equipment, motors, etc., and two car-dumping units. W. J. Towne, Chicago, is chief engineer.

Milwaukee Electric Railway & Light Co., 217 Michigan Street, Milwaukee, has plans for two new shop and service buildings, costing about $50,000 each, at Hales Corners and Delafield, Wis., for overhead construction and maintenance division of interurban lines. Work will begin at once. George G. Post is vice-president in charge of power.

E. D. Coddington Mfg. Co., 5024 Thirty-seventh Street, Milwaukee, manufacturer of metal and composition building materials, supplies and specialties, is commencing work on a one-story addition, 60 x 120 ft.

Milwaukee Department of Public Works, City Hall, has plans for addition to plant and equipment of municipal garbage disposal plant, for which an appropriation of $400,000 is available. C. E. Mallg is city architect.

Northern Conveyor & Mfg. Co., Janesville, Wis., which is erecting an addition to its plant, is enlarging its line of belt and flight conveyors, car unloaders, shaker screens, etc., with a power chassis, a self-propelled unit designed to fit all models of portable conveyors made by the company. Gasoline engines and steel wheels will be purchased.

Plant, equipment, stock and other assets of defunct Appleton Steel Tube Co., Appleton, Wis., will be offered for sale at public auction by H. W. Tuttrup, receiver, on Monday, April 28. Inventory includes 425 tons of finished steel tubing on hand when operations were discontinued several months ago.

Cleveland

CLEVELAND, March 31.—An order from the Russian Government for 35 turret lathes was placed with a local manufacturer the past week by the Amtorg Trading Corporation for the Stalingrad tractor plant. Aside from this purchase the market was dull during the week. Machine tool business generally tapered off the latter part of the month and March sales were below those in February. Very little new inquiry came out during the week. Demand for presses is light, being limited mostly to an occasional order from the electrical, stove and building material industries.

Equipment of automobile plant of F. B. Stearns Co., Cleveland, including several hundred machine tools, will be offered at auction April 8-10.

Chain Products Co., 3924 Cooper Avenue, Cleveland, has awarded general contract to Albert M. Higley Co., Plymouth Building, for one and two-story addition, to cost about $50,000 with equipment. Richards & Co., Ontario and St. Clair Avenues, are architects.

Warrior Aeronautical Corporation, Alliance, Ohio, recently formed to take over Alliance Aircraft Corporation, with local plant, is arranging for early resumption of production, and will devote output largely to glider aircraft to retail at about $1,500; heavy commercial planes will also be manufactured. The new company will have a working capital of $150,000, and is headed by James D. Campbell, Kenneth M. Ronan and A. Edward Kunzl, all former officials of Stinson Aircraft Corporation, Detroit.

Atlas Steel & Supply Co., 4401 Trumbull Avenue, Cleveland, has plans for a one-story machine and mechanical shop, 100 x 150 ft., to cost about $60,000 with equipment. Walther J. Wafel, 5716 Euclid Avenue, is architect.

Cleveland Corrugated Box Co., 5305 Sweeney Avenue, Cleveland, manufacturer of corrugated paperboard and fiber containers, has arranged for purchase of plant and business of Canton Fibre Box Co., Canton, Ohio, manufacturer of kindred products, and will operate as a branch plant. Name will be changed to Canton Corrugated Box Co. and production increased.

Libbey-Owens Glass Co., Toledo, Ohio, has arranged for merger with Edward Ford Plate Glass Co., with main plant at Rossford, Ohio. Consolidated company will be known as Libbey-Owens-Ford Glass Co. Libbey-Owens company is carrying out expansion at Toledo mill to cost more than $750,000. J. C. Blair will be president of new organization.

Chicago

CHICAGO, March 31.—The closing days of March were the dullest so far this year, and with most dealers the month will be the poorest since the end of 1929. The blizzard, the worst in many years in northern Illinois, eastern Wisconsin and much of Indiana, was unquestionably a factor in the week's business. Many country roads are still impassable and urban transportation still is handicapped, the result being that salesmen and buyers have been forced to delay plans.

The Santa Fe continues to place orders against its list. Although the Milwaukee road from time to time appears to be ready to make purchases, still it cannot be learned that any actual orders have been placed. The Northern Pacific will buy a 24-in. lathe, a 36-in. lathe and a tire lathe. It is understood that this railroad will soon make additional requests for prices. A Chicago automobile accessory manufacturer is studying requirements, and prices are being asked by Allis-Chalmers Mfg. Co. on a few items for its plants at Springfield, Ill., and West Allis, Wis.

Triangle Package Machinery Co., 416 Huron Street, Chicago, has awarded a contract to A. W. Jensen, 192 North Clark Street, for a one-story plant, 75 x 113 ft., to cost about $45,000 with equipment. A. E. Strobel, 192 North Clark Street, is architect.

General Transformer Corporation, Jackson Boulevard and Peoria Street, Chicago, manufacturer of transformers for radio service and other electrical apparatus, has leased from Marquette Tool & Mfg. Co. its plant at 4500 Cortland Street, totaling about 20,000 sq. ft. floor space, soon to be vacated by last-noted company for new plant at Sixty-fifth Street and Natchez Avenue. General Transformer Corporation will remove to new location and install additional equipment.

Nuckolls Packing Co., South Santa Fe Avenue, Pueblo, Colo., meat packer, has plans for two-story addition to canning factory, to cost $70,000 with equipment, including conveying and other mechanical-handling apparatus. W. H. Raschke is manager.

Midwest Refining Co., Denver, has plans for a new oil storage and distributing plant at Butte, Mont., with pumps, tanks, etc., to cost about $100,000 with equipment. A similar plant is proposed at Great Falls, Mont., to cost close to a like sum.

Minnesota Power & Light Co., West Superior Street, Duluth, Minn., has plans for new steam-operated electric generating plant in western part of city, to cost over $3,000,000 with transmission line extensions. Ultimate station will have a rating of 250,000 hp., and will represent investment of about $18,000,000.

Raymer Hardware Co., 58 East Fifth Street, St. Paul, Minn., has leased one-story and basement building to be erected on University Avenue, to cost about $45,000, for new storage and distributing plant. Toltz, King & Day, Inc., Builders' Exchange, is architect.

P. J. Vollman, 5635 North Sacramento Street, Chicago, machinist, has plans for a three-story machine shop, to cost about $40,000 with equipment.

Safety Signal Corporation, Waterloo, Iowa, care of Dr. W. L. Hearst, Waterloo, recently formed by Dr. Hearst and associates, is considering new one-story plant for manufacture of signal devices and equipment, to cost about $35,000 with equipment. P. C. Peterson, Waterloo, is also interested in company.

Aurora Metal Cabinet Works, Aurora, Ill., has been purchased by Swords Brothers, Rockford, Ill., for a branch plant. Swords company is distributor of mill supplies, plumbing and heating equipment.

Viking Pump Co., Cedar Falls, Iowa, has awarded contract for a two-story addition, 58 x 122 ft., to cost $20,000.

Pittsburgh

PITTSBURGH, March 31.—March sales by local dealers are somewhat at variance individually, although with the majority the month seems to have been little better than January or February. Business is confined principally to single tools or small lots and there is an active demand for repair parts and replacement equipment.

New inquiry is still coming out in restricted volume, although total work pending compares not unfavorably with the usual volume at this time of year. The Pennsylvania Railroad is expected soon to close on a special milling machine for its Altoona shops, and the Chesapeake & Ohio is inquiring for an 18-in. lathe. The latter road made heavy machinery purchases last year and is not expected to be an active buyer this season.

Hope Natural Gas Co., 545 William Penn Way, Pittsburgh, has approved plans for one-story steam power plant at compression station at Hastings, near Clarksburg, W. Va., to cost over $350,000 with equipment.

Montgomery-Lamer Steel Co., Pittsburgh, has been formed by R. C. Montgomery, 1112 North Highland Avenue, and Samuel Lamer, 3109 Hazelhurst Avenue, with capital of $25,000, and plans operation of plant for production of steel castings, forgings, etc., including ornamental iron fencing, gates, railings, etc. Lilias Elliott, 1317 Oregon Avenue, Steubenville, Ohio, is treasurer.

Dixon Motor Co., 2507 Beale Avenue, Altoona, Pa., manufacturer of motor trucks and parts, will proceed with superstructure for new one-story plant by day labor, 120 x 225 ft., to cost about $100,000 with equipment.

West Penn Electric Co., West Penn Building, Pittsburgh, operating electric light and power properties, is disposing of bond issue of $5,000,000, part of fund to be used for expansion and improvements in plants and system.

Atterbury Corporation, Black Lick, Pa., has work under way on new plant for manufacture of valves and kindred engineering specialties, to cost over $100,000 with equipment.

Rolland Glass Co., Clarksburg, W. Va., manufacturer of sheet glass under machine process, has plans for extensions and improvements in former handglass plant, known as Lafayette Works, at Northview, including installation of grinding, smoothing, beveling and other machinery for plate glass finishing service.

Plant and property of Penn Mfg. Co., Waynesburg, Pa., manufacturer of oil and gas tools and supplies, has been acquired by T. V. C. Zhanizer and Charles Parker, both of Washington, Pa. New owners plan change of company name to Zhanizer & Parker and will continue same line of output. Penn company is retaining its plant at Washington, Pa., and will conduct main operations there.

Gulf States

BIRMINGHAM, March 31.—City Council, Birmingham, has plans for municipal airport on 300 acre tract, comprising hangars, repair and reconditioning shops, and other field buildings, to cost over $100,000 with equipment. A. J. Hawkins is city engineer; E. W. Stanford, Birmingham, is architect..

Shreveport-El Dorado Pipe Line Co., Inc., Shreveport, La., has disposed of a bond issue of $1,000,000, part of fund to be used for expansion in pipe-lines and other facilities. B. H. Gray is vice-president.

A. G. Moffat, secretary, Sewerage and Water Board, 526 Carondelet Street, New Orleans, is asking bids until April 30 for riveted steel pipe for drainage pumping station No. 2; for one 700 to 800-kw. Diesel engine-driven unit for station C; pumps, floodgates, check valves, etc., and complete auxiliary equipment. George G. Earl is general superintendent.

Prest-O-Lite Co., Inc., 30 East Forty-second Street, New York, manufacturer of acetylene apparatus, welding equipment, etc., has taken bids on general contract for a one-story factory branch and distributing plant at San Antonio, Tex., to cost about $60,000 with equipment.

Mississippi Power & Light Co., Gulfport, Miss., has arranged for sale of block of 40,000 shares of preferred stock, part of fund to be used for extensions and improvements in power plants and system.

A. P. Borger, Amarillo, Tex., is planning construction of a grain elevator with capacity of 1,000,000 bu., with elevating, conveying, screening and other mechanical equipment, to cost $300,000.

Bogalusa Paper Co., Bogalusa, La., has work under way on addition to paper mill for production of kraft papers, to increase present capacity about 30 per cent, to be ready for service in fall, to cost over $1,000,000 with machinery.

City Council, Fort Worth, Tex., has plans for a one-story hangar, 80 x 160 ft., at municipal airport, with repair and reconditioning facilities, to cost about $35,000 with equipment. O. E. Carr, city manager, is in charge.

Southern Natural Gas Corporation, Meridian, Miss., has approved plans for construction of pipe line from Louisville, Miss., to Meridian, about 60-miles to cost $400,000 with compressor stations and equipment.

Gulf Concrete Pipe Co., Brownsville, Tex., recently acquired by new interests, is arranging an expansion and improvement program, including installation of additional equipment. Company is also planning early establishment of two new branch plants in other cities, to cost over $75,000 with machinery.

West Texas Utilities Co., Abilene, Tex., is arranging for construction of an electrically-operated ice-manufacturing and

cold storage plant at Memphis, Tex., to cost about $70,000 with machinery.

Pampa Independent School District, Pampa, Tex., will install a vocational and agricultural shop unit in addition to central high school, to cost $150,000, for which plans are being prepared by W. R. Kaufman & Son, Pampa, architects.

Quitman County Compress Co., Marks, Miss., is planning construction of new cotton compress plant on 50 acre tract, to cost $150,000 with presses, power equipment and auxiliary machinery.

John A. Roebling's Sons Co., Trenton, N. J., manufacturer of wire and cable, wire rope, etc., has filed notice of company organization to engage in business in Alabama, and will establish headquarters at Birmingham. Plans are being considered for a factory branch and distributing plant at latter place.

Gulf Pipe Line Co., Port Arthur, Tex., has authorized installation of pipe line from Hankamer oilfields, Liberty County, to Sour Lake, 22 miles, where connection will be made with main system, to cost over $100,000 with booster stations, etc. Extension will have capacity of 10,000 bbl. of oil per day.

Cincinnati

CINCINNATI, March 31.—Although demand for machine tools last week receded from the level of the preceding week, fresh bookings were in fair volume and more numerous than a month ago. On the whole machine tool business was much better in March than in either January or February. Inquiry has slackened somewhat the past week and consumers show no haste to enter the market for equipment after quotations are submitted. Orders are mostly limited to one or two machines at a time. Production is being sustained at a fair rate.

Okey Mfg. Co., Naghten and Water Streets, Columbus, Ohio, operating a machine and mechanical works, has asked bids on general contract for a one-story addition, 61 x 115 ft., to cost over $40,000 with equipment. Carmichael & Millspaugh, 5 East Long Street, are architects.

City Council, Hamilton, Ohio, will take bids in about 60 days for an addition to municipal electric light and power plant, including installation of new equipment, to cost $75,000. Froelich & Emery Co., Second National Bank Building, Toledo, Ohio, are architects and engineers. R. P. Price is city manager.

Ohmer Fare Register Co., Dayton, Ohio, manufacturer of fare registers, taximeters, parts, etc., is disposing of a note issue to total $1,500,000, part of proceeds to be used for expansion in manufacturing facilities.

State Department of Public Welfare, Columbus, Ohio, will take bids early in April for one-story power plant and equipment at Longview State Hospital, Cincinnati, including electric units, boilers, coal-handling equipment, etc., to cost about $225,000. T. Ralph Ridley, Ohio Hartman Building, Columbus, is architect.

Nashville, Chattanooga & St. Louis Railroad Co., Nashville, Tenn., has plans for a one-story addition to engine house, with repair facilities, at local shops, to cost about $35,000 with equipment.

Memphis Bottlers' Supply Co., 137 Calhoun Avenue, Memphis, Tenn., has awarded general contract to F. J. Ozanne, Empire Building, for one-story storage and distributing plant, totaling about 10,000 sq. ft. floor space, to cost over $28,000 with equipment. Joseph T. Wallace, Bank of Commerce Building, is architect.

American Air Filter Co., Inc., Louisville, Ky., has been formed by merger of Midwest Air Filter Co., National Air Filter Co. and Reed Air Filter Co. American Air Filter Co. has for some time been holding company, but consolidation into a single unit takes effect April 1.

St. Louis

ST. LOUIS, March 31.—F. M. Stambaugh & Sons, Inc., 4356 Maffit Avenue, St. Louis, manufacturer of tools, has taken bids on general contract for a one-story addition, 100 x 132 ft., to cost about $100,000 with equipment. Julius Tarling, 2806 North Grand Boulevard, is architect. F. M. Stambaugh, Jr., is president.

Century Electric Co., 1806 Pine Street, St. Louis, manufacturer of electric motors, controls, etc., has arranged for increase in capital from $4,750,000 to $7,500,000, part of proceeds to be used for expansion.

Kansas Gas & Electric Co., Sedgwick Building, Wichita, Kan., has closed bids on general contract for a three-story equipment service, repair and operating building, to cost over $400,000 with equipment. C. V. Waddington is chief engineer.

State Board of Administration, State House, Topeka, Kan., Harry Rhodes, business manager, has revised plans for one and two-story and basement industrial building at State school for deaf, Olathe, to cost about $35,000 with equipment. Joseph W. Radotinsky, State House, is architect.

American Tank Co., 1520 East Seventh Street, Oklahoma City, Okla., manufacturer of welded tanks and pressure vessels for oil and affiliated industries, has awarded general contract to Charles M. Demming Construction Co.; Oklahoma City, for substructure for one-story plant, 140 x 260 ft., to be built by all-welded process, to cost over $130,000 with equipment. Fabrication will be carried out at Kansas City, Mo., plant of Black, Sivalls & Bryson, Inc., Bartlesville, Okla., of which American Tank Co., is a subsidiary. Engineering department of parent company is in charge.

Moon Motor Car Co., 4400 North Main Street, St. Louis, has contracted with American Cotton Picker Corporation, St. Louis, to manufacture a quantity of recently patented cotton-picking machines, including parts and assembling, and will establish a department for such branch of output; contract calls for delivery of 5000 complete machine units this year.

Adams & Kelly Co., Omaha, Neb., operating a general millwork plant, will erect one-story addition to branch mill at Hastings, Neb., to cost about $40,000 with equipment.

Common Council, Paragould, Ark., has had estimates of cost made by W. A. Fuller Co., 2916 Shenando Avenue, St. Louis, engineer, for municipal electric light and power plant, in connection with municipal waterworks system, totaling $225,000 with equipment.

Harviell Stave & Heading Co., Harviell, Mo., has plans for a new one-story mill to cost about $55,000 with equipment. Majority of machinery will be electrically operated.

Stockholders of Buck's Stove & Range Co., St. Louis, will act April 8 on a proposal to sell its assets. Company was founded in 1849 as Buck & Wright Stove Co. About 50 stockholders hold capital stock of $750,000 each of preferred and common stock.

Indiana

INDIANAPOLIS, March 31.—Southern Stove Works, Inc., Evansville, is contemplating branch foundry at Chattanooga, Tenn., where negotiations are under way for site.

Lever Corporation, Quapaw, Okla., manufacturer and holding patents of Powell lever automobile engine, is arranging for merger with Elcar Motor Car Co., Elkhart, manufacturer of automobiles, under first-noted name. Lever company will transfer main operations to Elkhart plant for production of new motor car using Powell lever engine, and will carry out expansion to cost over $200,000 with equipment.

Southwestern Gas & Utilities Co., Evansville, is planning construction of additional pipe lines for natural gas service to several cities, with compression stations and auxiliary equipment, to cost over $150,000.

Standard Oil Co., of Indiana, Inc., 137 West Eleventh Street, Indianapolis, has authorized increase in capital from $450,000,000 to $500,000,000, a considerable part of fund to be used for acquisition of other companies, and expansion in storage and distributing facilities. Company will take over distributing and marketing division of its subsidiary, Midwest Refining Co., Denver, operating in Colorado, Wyoming and Montana, and Midwest company will concentrate as a refining unit in future. Other properties will be secured. Edward G. Seubert is president.

Following resignation of J. F. Bellinger as president and director of Lafayette Steel Products Co., Lafayette, manufacturer of automobile trunks and metal baskets, company has been reorganized with following officers: President, Henry I. Poor; vice-president, H. H. Johnson, Indianapolis; treasurer and general manager, E. J. Smith; secretary, H. E. Whitney.

Detroit

DETROIT, March 31.—Michigan Paper Corporation, Plainwell, has plans for extensions and improvements in power plant to cost over $250,000 with equipment. C. F. Hirschfield, 2000 Second Avenue, Detroit, is consulting engineer.

Timken-Detroit Axle Co., Clark Avenue, Detroit, manufacturer of automobile and motor truck axles, etc., has awarded general contract to C. O. Barton Co., 1900 East Jefferson Street, for two-story shop addition, to cost over $40,000 with equipment.

Essex Wire Co., Detroit, recently organized, is occupying part of plant of Ford Motor Co., at Highland Park, and will develop maximum facilities for production of automobile lighting, starting and ignition wire.

Consumers Power Co., Jackson, will carry out expansion and improvements near Grand Rapids, changing service from 30 to 60 cycles and installing additional equipment, to cost over $5,000,000. Stevens & Wood, 60 John Street, New York, are consulting engineers.

Allen Air Turbine Ventilator Co., 1040 Fourteenth Street, Detroit, manufacturer of ventilating equipment, is arranging to more than double present plant capacity, to cost over $75,000 with equipment. Com-

pany was acquired recently by H. R. Boyer and F. M. Alger, Jr. Mr. Boyer will be president; L. P. Halleck, vice-president; and Mr Alger, secretary and treasurer.

City Council, Wyandotte, has plans for extensions and improvements in municipal electric light and power plant, to cost about $250,000 with machinery. Froelich & Emery Co., Second National Bank Building, Toledo, Ohio, is consulting engineer.

Colonial Replacement Parts Co., 6834 Michigan Avenue, Detroit, is considering installation of a key-seating machine and other tools.

Electric Die Forging Co., Detroit, recently formed by John A. Nichols, Jr., Durant Motors, Inc., 5057 Woodward Avenue, and associates, with capital of $100,000, plans operation of local plant to manufacture forgings for automotive service. Charles Raine, Detroit, is also interested in new organization.

Michigan Public Service Co., Ludington, has plans for new power plant at Leland, to cost about $40,000 with equipment.

Village Council, Birmingham, Mich., is considering one-story municipal service, repair and garage building for automobiles and motor trucks, to cost about $50,000 with equipment.

Alamo Engine Co., Hillsdale, has arranged for increase in capital from $350,000 to $500,000 for general expansion.

Pacific Coast

SAN FRANCISCO, March 27.—United Engine & Machine Co., San Leandro, Cal., has awarded general contract to L. R. Martin, San Leandro, for initial unit of new plant group on 3-acre tract, one-story, primarily for manufacture of pistons for automobile engines, to cost about $35,000 with equipment. Engineering department of company is in charge.

Grazen Heat Control, Inc., 3009 Imperial Highway, Lynwood, near Los Angeles, manufacturer of heating apparatus, has awarded general contract to Elmer L. Tunsen, 3543 Louise Avenue, Los Angeles, for a one-story addition.

Pioneer Paper Co., 5500 South Alameda Street, Los Angeles, has awarded contract to Consolidated Steel Corporation, Los Angeles, for two and three-story addition, 50 x 100 ft., for an emulsion unit, to cost about $65,000 with machinery. Hamm, Grant & Bruner, Inc., Ferguson Building, is architect and engineer.

Imperial Ice & Development Co., Coachella, Cal., will erect a one-story ice-manufacturing plant to cost about $90,000 with equipment. Gay Engineering Corporation, 2650 Santa Fe Avenue, is engineer.

Board of Education, San Francisco, and Board of County Supervisors, Court House, jointly, plan construction of vocational shop units in connection with erection of new Aptos junior high school, to cost $700,000. Shea & Shea, 454 Montgomery Street, are architects.

Portland Electric Power Co., Electric Building, Portland, has approved plans for an addition to Three Links power station, Oak Grove district, to cost about $130,000 with equipment.

Klamath Locomotive & Machine Works, Inc., Klamath Falls, Ore., care of Carl F. Gerlinger, Dallas, Ore., recently organized by Mr. Gerlinger and associates, is planning new plant at Klamath Falls, consisting of eight one-story units for general machine shop, forge shop, foundry, assembling works, storage and distributing service, to cost over $350,000 with equipment. Company will specialize in manufacture of lumber carriers and conveyors, industrial locomotives, centrifugal pumps and kindred mechanical products.

Port Commission, Tacoma, Wash., has authorized immediate construction of new cold storage and refrigerating plant, four-stories, 130 x 165 ft., with engine and power house adjoining, 26 x 130 ft., to cost about $300,000 with machinery. George W. Osgood is manager of port docks.

Producers' Cotton Oil Co., Calwa, Cal., is planning extensions and improvements in local mill, including installation of new equipment, to cost $100,000.

Canada

TORONTO, March 31.—Cadwell Sand & Gravel Co., Ltd., 228 Sandwich Street, Windsor, Ont., will call for tenders soon for a one-story machine shop, 14 x 100 ft., to cost $60,000.

Bids will be called soon for a one-story addition, 240 x 310 ft., to plant of Canadian Bridge Co., Walkerville, Ont., to cost $100,000.

W. S. Tyler & Co., 3615 Superior Avenue East, Cleveland, have awarded general contract to Newman Brothers, 75 St. Paul Street, St. Catharines, Ont., for a one-story factory at St. Catharines, to cost $100,000. Building to be 100 x 400 ft. and will be used for manufacture of wire screens, ornamental bronze, etc., G. S. Rider Co., Marshall Building, Cleveland is architect and engineer.

Hamilton Gear & Machine Co., 76 Van Horne Street, Toronto, has let general contract to Wells & Grey, Ltd., Confederation Life Building, for a one-story, addition, 40 x 120 ft., to cost $20,000. Harkness & Hertzberg, Confederation Life Building, Toronto are engineers.

Moss Mines, Ltd., 132 James Street West, Montreal, is contemplating erection of a 100-ton mill at Kashabowie, Ont.

Niagara Falls Water Commission, Queen Street, Niagara Falls, Ont., will call for bids soon for construction of a power house and filtration plant to cost $500,000 in Queen Victoria Park. H. G. Acres & Co., Ltd., Ferry Street, is engineer.

Town Council, Annapolis Royal, N. S., contemplates purchase of equipment for an electric plant to cost $18,000. F. W. Harris, is clerk.

Airland Mfg. Co., Ltd., Richmond, B. C., will start work at once on an assembly plant, 100 x 110 ft., to cost $50,000.

Foreign

CONTINENTAL CAN CO., 1 Pershing Square, New York, manufacturer of tin cans and containers, is planning to double present capacity at plant near Havana, Cuba, to cost over $200,000 with equipment. O. C. Huffman is president.

Rhine-Westphalia Electric Power Corporation (Rheinisch-Westfalisches Elektrizitatswerk Aktien-Gesellschaft), Dortmund, Germany, is disposing of a bond issue of $20,000,000 in United States, part of proceeds to be used for expansion and improvements in electric power plants and system.

Associated Oil Co., 11 Broadway, New York, a unit of Tide Water Associated Oil Co., same address, is forming Mitsubishi Oil Co., Tokyo, Japan, in cooperation with Mitsubishi Co., of that place, to establish and operate oil refining, storage and distributing plants in different parts of Japan.

Saint Gobain Chemical Co., Salome (Nord), France, has authorized plans for new local works for production of sulphuric acid, superphosphates and kindred specialties, to cost over $300,000 with equipment.

Krizik & Co., Bodenbach, Czechoslovakia, manufacturers of wire and cable, are planning to rebuild part of works recently destroyed by fire, with loss close to $1,000,000 including machinery.

Welch Grape Juice Co., Westfield, N. Y., is considering construction of group of fruit juice plants and canneries in Morocco and part of French Provinces in Northern Africa, to include crushing, conveying, bottling and other equipment, entire project to cost over $1,000,000.

New Trade Publications

Heavy Machinery.—Mesta Machine Co., Pittsburgh. Bound catalog of 126 pages, illustrating and describing various types of heavy machinery for steel mill and foundry use, including gas and steam-blowing engines for blast furnaces, rolling mills, forging presses, shears, etc. A large number of installation views are shown, besides many illustrations of the company's facilities for making its product. Unusually heavy gears, spur, herringbone, staggered tooth, etc., are featured.

Testing Machines.—Riehlé Brothers Testing Machine Co., Philadelphia. An eight-page folder, illustrated, describes a series of machines for testing cement, and lists a few important users of this apparatus.

Steel Castings.—Sivyer Steel Casting Co., Milwaukee. An elaborate 16-page pamphlet, 12 by 18 in., illustrated, describes the various departments of the Sivyer and Nugent plants of this recently formed combination of the Sivyer company with the Nugent Steel Castings Co., Chicago. Excellent photographs cover employees, testing laboratory and several parts of the foundry.

Zinc and Its Products.—New Jersey Zinc Co., New York. A beautifully prepared 70-page book, entitled "The Technical Department of the New Jersey Zinc Company," discusses the work of that department in its various phases. Several portions of the book, fully illustrated, treat of the fundamental research division, the field research division, the metal research division and the service division.

Gas Pumps.—P. H. & F. M. Roots Co., Connersville, Ind. Bulletins No. 32-B1 and 33-B2, four pages, illustrating Roots standard-duty and heavy-duty roller bearing rotary gas pumps, with recommendations for coupling to power source.

Air Separators for Laboratory Use.—Federal Pneumatic Systems, Inc., 127 North Dearborn Street, Chicago. Bulletin No. 25, four pages, describing Federal centrifugal separators.

Pulverizing Mills.—Fuller Lehigh Co., Fullerton, Pa. Circular 902, telling

The Week's News Quickly Told

Current Events That Bear on the Course of Business

INDICES of business reflect the uncertainties of the moment. No evidences of improvement are shown in weekly car loadings; bank clearings and commodity prices are not yet pointed to a turn. Stock quotations, however, are mounting rapidly.

* * * * *

OPINION on essentials of prosperity were stated by two prominent industrialists . . . Owen D. Young said "Let no man think that the living standards of America can be permanently maintained at a measurably higher level than those of the other civilized countries. Either we shall lift theirs to ours or they will drag ours down to theirs. Tariffs and other petty political barriers, temporarily justifiable, will in the long run only accentuate the trouble." . . . Henry Ford said that if we keep wages high and prices low and enforce prohibition, "prosperity will gradually seap through the whole country." He will establish a $25 minimum weekly wage in his new English factory, a rate the equivalent in purchasing power of his Detroit scale.

* * * * *

HOUSING for nearly a million families will be needed in 1930 to replace fire losses and obsolete dwellings and to provide for new families. C. M. Woolley, American Radiator & Standard Sanitary Corporation, expects an early resumption in such building, because in the past a low rate on commercial loans has presaged such an expansion.

* * * * *

UNION labor members in March were 79 per cent employed in 24 cities, slightly gaining from 78 per cent in February . . . Employment conditions in Cincinnati have been far above average, since the municipality organized for business depression over a year ago. It has made a periodic industrial census and established efficient employment offices, speeded public works, fostered odd jobs in public institutions and discouraged migratory workers. Furthermore, local manufacturers are operating generally on short schedules with full crews.

* * * * *

A WOMAN in industry, if of the middle class, married and with children, must earn at least $3,500 a year in order to pay for the extra help required to operate her home, said Frances Perkins, New York State Commissioner of Labor.

* * * * *

RAILROAD systems of great extent are being built up through purchase of "working control" of common stock by holding companies . . . Pennsylvania Railroad, with its subsidiaries Pennsylvania Company and Pennroad Corporation, controls about 22,000 miles of line, including the Wabash, Lehigh Valley, Norfolk & Western, New Haven and Boston & Maine. Pennroad Corporation has spent $226,000,000 in the last two years for such acquisitions, including important holdings in Southern Railway and Atlantic Coast Line. . . . Allegheny Corporation has acquired stock control of the Chicago & Eastern Illinois Railway, which brings the mileage under Van Sweringen control to about 18,000. Included are Erie, Chesapeake & Ohio, Nickel Plate, Pere Marquette, Missouri Pacific, Denver & Rio Grande Western, International & Great Northern and Texas & Pacific.

* * * * *

MERGERS in Northern California are looking toward a $650,000,000 consolidation of electric power and gas companies . . . Libbey-Owens Co. and Edward Ford Plate Glass Co. agree to consolidate, thus becoming the largest manufacturer of sheet glass . . . Five miners of Pennsylvania soft coal, with annual output of 7,500,000 tons, consolidate their marketing organizations . . . North German Lloyd and Hamburg-American Lines have prepared a 50-year cooperative agreement to share port facilities, arrange for non-competitive sailings and divide profits equally. The pool will control 330 ships, aggregating 2,000,000 tons.

* * * * *

EUROPA sets a new Trans-Atlantic record on her maiden voyage, making a 24-hr. average of 29 knots per hr., and 27.9 knots for the entire trip. She is 936 ft. long, 101 ft. beam and can carry 2200 passengers; an oil burner, developing 128,000 hp. in four sets of high pressure turbines, each geared to its own propeller . . . . Traffic in the Panama Canal increased 7 per cent in 1929. Coastwise traffic in steel is the principal westbound freight.

* * * * *

CORPORATE earnings of General Electric Co. reached a record net of $67,290,000 . . . Radio Corporation of America, which earned $20,000,000 in 1928, was able to clear only $16,000,000 last year, despite acquisition of Victor Talking Machine Co. . . . Net profits of 53 chains increased from $122,000,000 in 1927 to $137,000,000 in 1928 and $152,000,000 in 1929 . . . Gross earnings of the Fifth Avenue bus lines (New York) have declined $500,000 each year since 1927.

* * * * *

TAXES paid since Jan. 1 have exceeded those for the like period in 1929 by $124,000,000. Federal income tax receipts in March were only slightly less than a year ago.

of economic and mechanical aspects of pulverizing mills of both the air and screen separation type.

Aircraft Tubing.—Summerill Tubing Co., Bridgeport, Pa. Booklet of 24 pages, 8½ x 11 in. This publication by one of the largest makers of tubing for aircraft contains complete data on all the various types used in airplanes, such as round, square, elliptical and streamline shapes. Physical and chemical requirements for aircraft use are given on straight carbon and chrome-molybdenum steel, a table of weights and list prices per foot on various diameters of tubing, and there are numerous illustrations from photographs taken in the company's plant. The booklet also contains a liberal abstract of an article by the consulting metallurgical engineer of the Summerill Tubing Co. on the saving in weight at low cost offered by proper heat treatment of tubing.

Riveting of Aluminum. — Aluminum Co. of America, Pittsburgh. Pamphlet of 23 pages, describing machines adaptable to the riveting of aluminum, rivet sizes, precautions to be taken, and design and properties of the joint.

Diesel Engines.—Busch-Sulzer Brothers Diesel Engine Co., St. Louis. 16-page pamphlet dealing with various types of Diesel engines for use on peak loads. Views of industrial installations are given, and tables of costs of operation.

Induction Motors.—Reliance Electric & Engineering Co., Cleveland. Bulletin 106 of 15 pages illustrating and describing type AA induction motors with ball bearings for two and three-phase alternating-current circuits. Illustrations show manufacture and assembly of parts. Tables of ratings and dimensions are given.

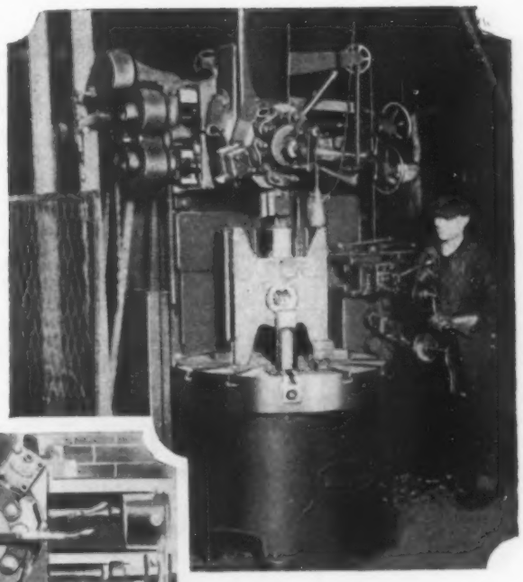
Truck Power. — Ready-Power Co., 3820 Grand River Avenue, Detroit. Bulletin 52 of eight pages illustrates and describes various uses for Ready-Power gasoline and electric equipment for electric industrial trucks.

Motor Buckets.—Hayward Co., 50 Church Street, New York. Bulletins 654 and 700 of 8 and 11 pages deal with Class "K" clamshell buckets used for excavating through surface soil and clay, loam, sand and shale; also electric buckets generally applied to overhead and monorail cranes for use in and about foundries and industrial plants.

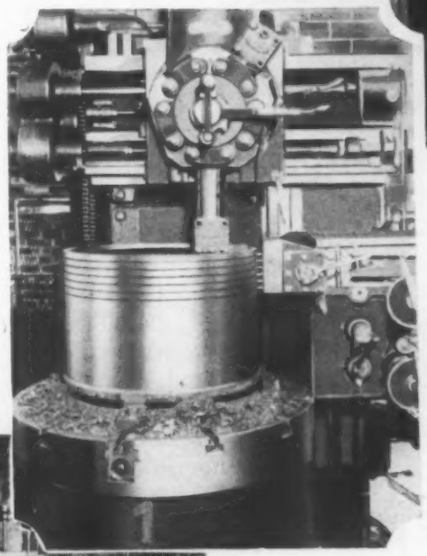
Industrial Equipment.—Heppenstall Co., Pittsburgh. Bulletin of 27 pages dealing with various types of steel products for industrial use. Illustrations include 20-ton acid open-hearth furnace used for manufacturing Heppenstall steels, die blocks, shear knives, forgings made to meet physical and chemical specifications, etc.

Greater Gains in Production—

Production measured in quantity, quality and economy are the real reasons why users purchase machine tools.



Performance must be backed by features of design and construction that assure easy manipulation, high speed and power to the cutting tools.



Steady, high production springs from but one source — dependable equipment.

Whether it is installed for the production of standard parts—parts on which the same group of operations are repeated—or for the purpose of jobbing—the Bullard Spiral Drive Vertical Turret Lathe is always ready to bore, face, turn and perform similar operations with speed, precision and economy.

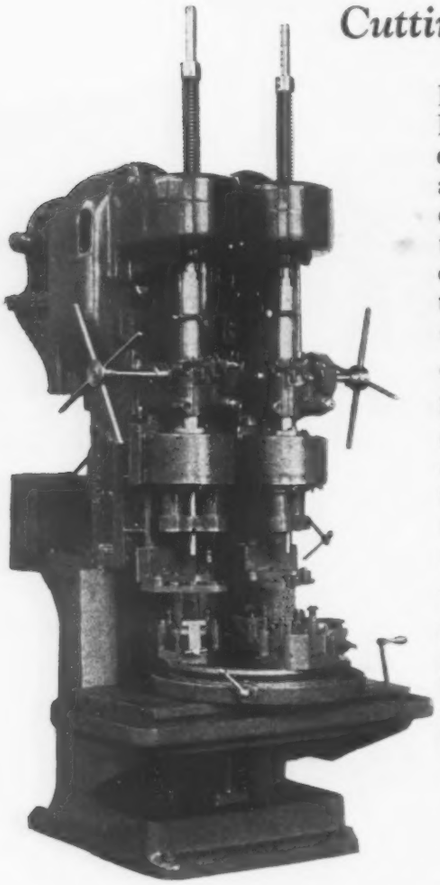
Vertical Turret Lathe and Auto-Matic Vertical Turret Lathe

Bridgeport BULLARD Connecticut

TOOLS THAT FAN THE AIR

CAN'T REDUCE DRILLING COSTS!

DIRECT-DRIVE Uprights Keep All the Tools Cutting Practically All the Time



DIRECT-DRIVE Upright Drilling Machines may be equipped with an indexing table and drill head, and when so equipped practically all of the time is actual cutting time. It is obvious that drills turning idly in the air are not tending to reduce operating time.

This is a matter which is going to be very much in the foreground during 1930, and anything that contributes to a shortening of the time between actual cuts is most certainly a move in the right direction.

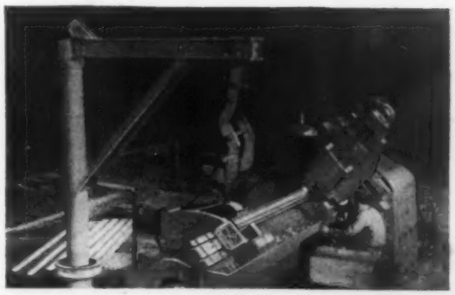
You'll save time and reduce maintenance cost to the minimum by drilling production jobs on the DIRECT-DRIVE. Let us give you the whole story in the DIRECT-DRIVE catalog. We await your request.

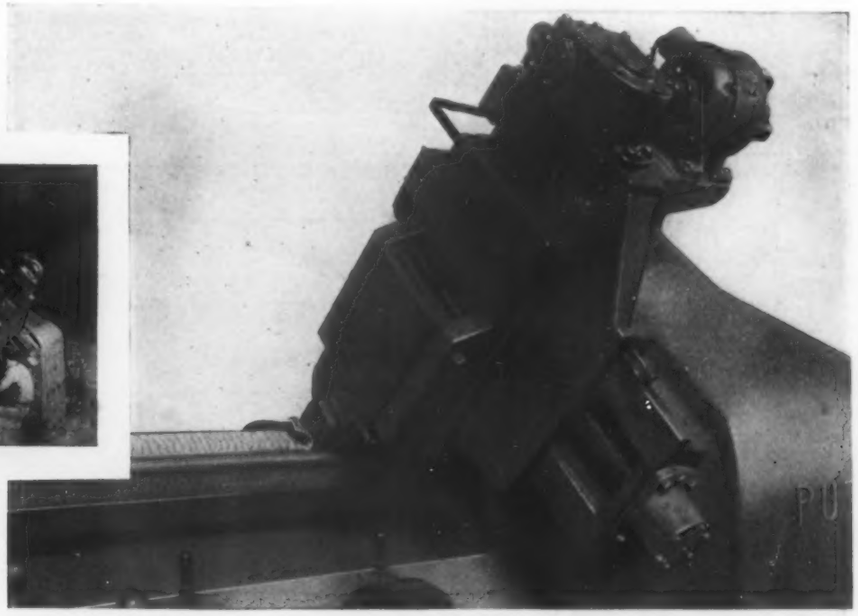
The **DIRECT-DRIVE** *Upright*

THE CINCINNATI BICKFORD TOOL CO.

Oakley, Cincinnati, Ohio

and NOW... *a Square Billet Completely Peeled in* 12 *Minutes from Floor to Floor*





Special Production Machinery for Steel Mills

•

Billet Peelers

•

Squaring and Slitting Shears for Metal Sheet Mills

•

Heavy Duty Machine Tools for Industrial Use

•

Special Purpose Machinery

THE new Putnam Billet Gouger multiplies the work of one man at least 15 times. These figures prove it:

To hand-chip (with pneumatic chisel) a 6" x 6" x 10'6" billet, average time 2½ hours.

To plane the same size billet all over by the Putnam Billet Gouger, averages 12 minutes from floor to floor.

The main feature of this new machine is the marvelous flexibility of movement afforded to both table and cutting tool. All controls are centered within comfortable reach of the seated operator. He can direct the cutting tool with almost the same ease as he would run his finger along the billet, following the camber as well as surface defects such as seams, scratches and broken surfaces.

These Billet Gougers are built to handle work up to 12" x 12" x 17'0", and are worthy associates of the Putnam Round Billet Peeler which has proven so successful.

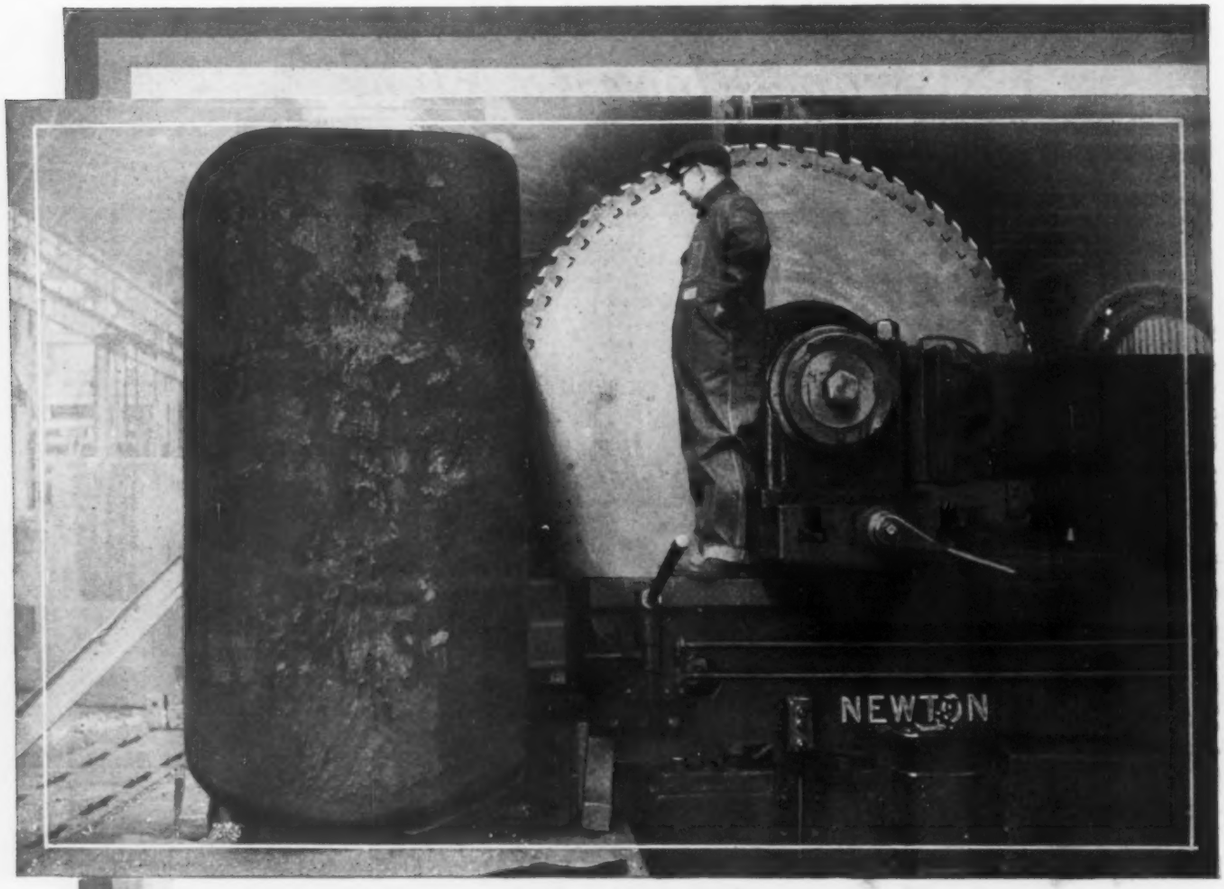
Manufactured at
PUTNAM MACHINE WORKS, Fitchburg, Mass.
Owned by
MANNING, MAXWELL & MOORE, Inc.
General Offices: 100 E. 42nd St., New York City

Branches: Chicago Detroit Philadelphia St. Louis

Representatives:
Arch Machinery Co., 1005 Park Bldg., Pittsburgh, Pa.
Smith Booth Usher Co., 228 Central Ave., Los Angeles, Cal.
International Equipment Co., Ltd., Royal Bank Bldg., Montreal, Canada

MANNING, MAXWELL & MOORE, Inc.

CONGRATULATIONS, *Henry Disston & Sons, Inc.* *on the World's Largest Saw Blade*



IT is no little achievement to build a 110″ saw blade, and two more 105″ blades all to run on the same cold saw. You are to be congratulated Henry Disston & Sons, Inc. And to you, too, The Midvale Co. congratulations are due on making some of the world's largest forgings, your latest almost twice as heavy as this 70 ton forging. But without NEWTON'S world's largest cold saw, these blades and these forgings might be as useless as last week's bridge prize. ¶ Let nothing daunt you, however, as nothing

CONSOLIDATED MACHINE TOOL CORPORATION OF AMERICA
Rochester, N. Y., U. S. A.

BETTS : COLBURN : NEWTON : HILLES & JONES : MODERN

CONSOLIDATED

CONGRATULATIONS, *The Midvale Co.* *on the World's Largest Steel Forgings*

daunts us. Just keep on making the world's largest forgings, and building the world's largest saw blades —105″, 110″, and even larger, and rest assured that CONSOLIDATED will build the machines that make them useful. ¶ And to you users of machine tools, large or small, whatever your machining work may be, remember that CONSOLIDATED can help you too, like it has helped Midvale and is helping many others in this country and abroad.

CONSOLIDATED MACHINE TOOL CORPORATION OF AMERICA
Rochester, N. Y., U. S. A.

BETTS : COLBURN : NEWTON : HILLES & JONES : MODERN

CONSOLIDATED

ARMSTRONG WRENCHES Have Created New Standards of Excellence for Wrenches

ARMSTRONG WRENCHES

pay in firm grips, time saved, and in accidents prevented

ARMSTRONG Drop Forged Wrenches make a good investment, for they take hold easily, quickly, grasp firmly, prevent slips—save time, machines and men. They are strong, dependable tools, forged from special steel that gives them both stiffness and strength. Made in 36 patterns, in hundreds of sizes and shapes, there are ARMSTRONG Wrenches for every use. Proportions have been accurately determined, giving not only exceptional strength but balance, "handiness," as well. Jaws are accurately milled in all standard openings, with special millings available on short notice.

ARMSTRONG-VANADIUM
longer, lighter, thinner wrenches

For tight places, on automatic screw machines for example, there are no wrenches like the ARMSTRONG-VANADIUM. Forged from chrome-vanadium tool steel, these are longer, lighter, thinner yet stronger. They are guaranteed not to break or spread.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
309 N. Francisco Avenue, CHICAGO, U. S. A.

ARMSTRONG

Tool Holders
"C" Clamps Lathe Dogs
Ratchet Drills
High Speed Steel Bits
Drop Forged Wrenches
Chain Pipe Wrenches
Pipe Wrenches

ARMSTRONG BROS.

Solid Dies and Stocks
Adjustable Dies and Stocks
Ratchet Stocks
Triplex Stocks
Pipe Cutters
Chain Vises
Hinged Pipe Vises
Knife Blade Cutter Wheels

WRITE for Catalog B-27. Shows, describes and prices all ARMSTRONG Tools

ARMSTRONG

TRADE MARK REG. IN U.S. PAT. OFFICE

ARMSTRONG

cooper hewitt light is as "SOFT" *as moonlight*

yet better than daylight

THE late Dr. Steinmetz, electrical genius, is one of a number of authorities for the statement that yellow-green light is the most harmless, the least irritating to the eye. "The harmful effect of working very much under artificial illumination," he wrote, "does not exist with cold light such as the light of the mercury lamp."

Science says the cool yellow and green rays of the spectrum are the rays by which we see best. The remarkable seeing power of Cooper Hewitt light is accounted for by the composition of its spectrum — over 90% yellow-green.

Cooper Hewitt mercury-vapor lamps give light that is as soft as moonlight, yet better than daylight. The reason is that it is composed *almost exclusively* of the light rays found *in the middle* of the spectrum. To understand why these are the rays of greatest *seeing power* you have only to remember that as you go away from the middle of the spectrum in *either* direction you reach light waves by which the eye does not see at all. At one end is the infra-red; at the other, ultra-violet.

Blue and violet, which have comparatively little seeing power, comprise less than 10% of Cooper Hewitt light.

Cooper Hewitt light for most industrial uses is *better than daylight.* In plants where it is used workmen see all objects as sharply and clearly as if they were magnified. To realize this you have to remember only two facts: That the colors of which daylight is made come to a different focal point after they pass through the lens of the eye, and that Cooper Hewitt light is made up mostly of yellow and green which focus practically as one color (yellow-green). Thus it makes objects sharper and clearer in form and outline.

Many other advantages of Cooper Hewitt light are explained in a new illustrated booklet. You are invited to write for it. No obligation. General Electric Vapor Lamp Company, Hoboken, N. J.

Join us in the General Electric Hour, broadcast every Saturday evening at 9 o'clock E.S.T. on a nation-wide N. B. C. network.

GENERAL ELECTRIC

VAPOR LAMP COMPANY

(Formerly Cooper Hewitt Electric Company)

[See next page]

Cheaper to prevent than to pay for–

Hundreds of industrial accidents happen like this:

The power was shut off. Two workmen started to disassemble one of six semi-automatic, group driven machines. A repairman, cleaning the others, needed a certain tool. A bright, bare, drop-lamp, suspended as usual just above the machine's working level, threw its glare into his eyes—and cast the dark shadow of the machine-frame across the safety switch. He reached for the tool and grasped—the switch.

✚

Result: A part of one workman's finger severed; the other's foot bruised and his arm cut.

✚

Adequate and proper illumination, the insurance company reported, almost surely would have prevented this accident—just as it would prevent thousands of others throughout industry.

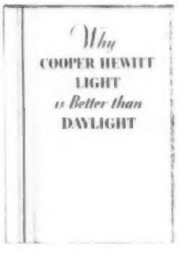
BETTER THAN DAYLIGHT

And who paid for this accident? Well, in compensation and medical charges the insurance company paid—$317. In uninsured and uninsurable damage to machines, plus idleness, plus interrupted operating schedule, the employer who was "economizing" on his lighting bill paid—$1,700.

✚

On the other side of this page you may read how Cooper Hewitt mercury-vapor illumination can prevent accidents in industrial plants by providing light that is "better than daylight." In hundreds of modern plants today Cooper Hewitt light is *proving* how much cheaper it is to prevent than to pay for accidents—in addition to increasing production, reducing spoilage and otherwise improving efficiency generally.

General Electric Vapor Lamp Co.,
833 Adams St., Hoboken, N. J.



MANY other advantages of Cooper Hewitt illumination are given in a simply written booklet "Why Cooper Hewitt Light is Better than Daylight" which will be sent gladly upon request

Join us in the General Electric Hour, broadcast every Saturday evening at 9 o'clock E. S. T., on a nation-wide N. B. C. network

GENERAL ELECTRIC
VAPOR LAMP COMPANY

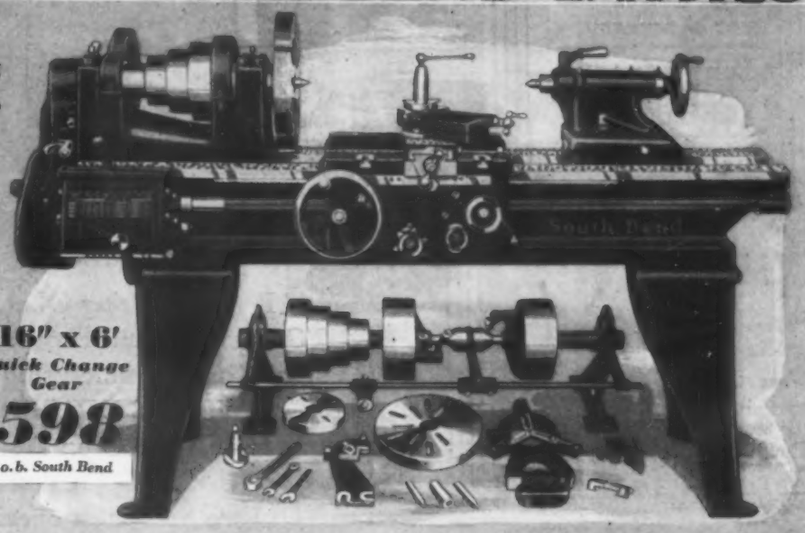
(see preceding page)

(Formerly Cooper Hewitt Electric Company)

NEW MODEL SOUTH BEND LATHES

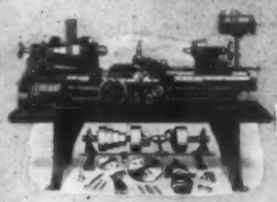
Back Geared, Screw Cutting
PRECISION LATHES
for use in

- Manufacturing Plants
- Tool Rooms
- Machine Shops
- General Repair Shops
- Marine Shops

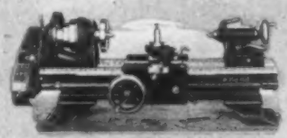


16" x 6' Quick Change Gear
$598
f. o. b. South Bend

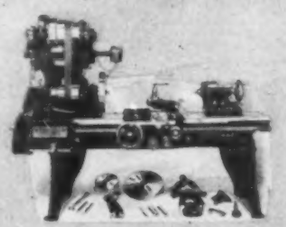
Countershaft and lathe equipment included in price



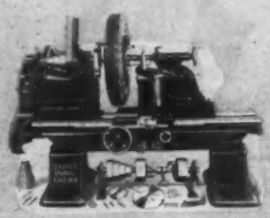
16" x 6' New Model Tool Room Lathe with Tool Room Equipment **$842**



9" x 3' New Model Junior Bench Lathe with Countershaft and Equipment . . . **$169**



18" x 8' Silent Chain Motor Driven Quick Change Gear Lathe with Motor . **$1049**



36"x6' Large Swing Standard Change Gear Lathe with Countershaft and Equipment . . **$688**

More than 48,000 Users in 78 Countries

The New Model South Bend Lathe is overwhelmingly popular because of its high quality and moderate price, both the result of 24 years' experience in lathe building. It is used by leaders of every industry, including:

American Tel. and Tel. Co.
General Electric Company
General Motors Corporation
International Harvester Co.
National Cash Register Co.
New York Central R. R. Co.
Olympic Steamship Company
Pratt and Whitney Aircraft Co.
Radio Corp. of America
Westinghouse Elec. & Mfg. Co.

The New Model South Bend Lathe is built in 96 sizes from 9" to 18" swing and 3' to 12' bed length. It is supplied with countershaft or motor drive, in a style for every purpose. Send for a free copy of New Catalog No. 91-A.

Carried in Stock by:

Boston, Mass.: Lynd-Farquhar Co.
Bridgeport, Conn.: A. C. Biagood
Buffalo, N. Y.: J. L. Osgood Mchy. & Tool Co.
Chicago, Ill.: C. B. Burns Machinery Co.
Cincinnati, Ohio: The E. A. Kinsey Co.
Cleveland, Ohio: Hess-Schenck Co.
Dallas, Texas: Huey & Philp Hardware Co.
Dayton, Ohio: C. H. Gosiger Machinery Co.
Detroit, Mich.: Lee Machinery Co.
Houston, Texas: Peden Company
Kansas City, Mo.: H. J. Brunner Hardware Co.
Los Angeles, Calif.: Eccles & Davies Mchy. Co.
Milwaukee, Wis.: Badger-Packard Co.
Minneapolis, Minn.: F. E. Satterlee Co.
Newark, N. J.: Cassell Machinery Co.
New York City: A. C. Colby Machinery Co.
Philadelphia, Pa.: Delta Equipment Co.
Pittsburgh, Pa.: Reliance Mchy. Sales Co.
Plainville, Conn.: Ideal Mchy. Co.
Providence, R. I.: Brownell Machinery Co.
San Francisco, Calif.: Herberts-Moore Mchy. Co.
Seattle, Wash.: West Coast Mchy. Co., Inc.
St. Louis, Mo.: Colcord-Wright Mchy. Co.
Syracuse, N. Y.: H. A. Smith Mchy. Co.

In Canada:

Montreal, Quebec: Canadian Fairbanks-Morse
Toronto, Ontario: A. R. Williams Mchy. Co.

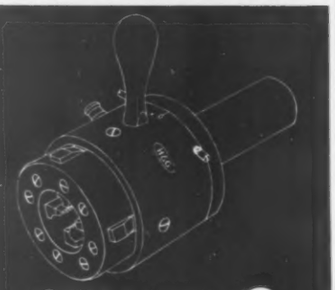
Established 1906 — Lathe Builders for 24 years

South Bend Lathe Works
525 East Madison Street
South Bend, Indiana, U. S. A.

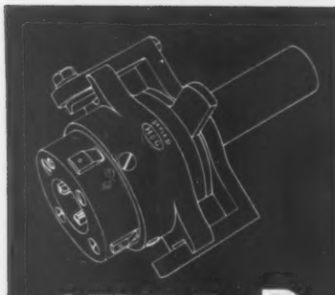
DIE HEADS
FAMOUS
for Accuracy,
Long Life and
Dependability

STYLES AND SIZES FOR ALL MACHINES

STYLE EE



STYLE C



STYLE D

IF you are using OLD Die Heads on your AUTOMATICS and experiencing difficulties in making adjustments...causing shutdowns...install H & G STYLE EE DIE HEADS. If you ARE NOT THREADING on Automatics . . . install H & G DIE HEADS and save the costs of RE-HANDLING and extra operations.

If you are still using SOLID dies on your BROWN & SHARPE Automatics . . . . install H & G STYLE D DIE HEADS and eliminate reversing the spindle and get the benefit of the new high production speeds possible from High Speed HOBBED Chasers.

On Hand Turret Machines H & G STYLE C DIE HEADS permit higher speeds with unsurpassed thread quality.

New Thread Data Book

Sent Free Upon Request

The Eastern Machine Screw Corporation
Truman and Barclay Streets, New Haven, Connecticut

ALL styles
of H & G Die
Heads use
the SAME
CHASERS

H & G DIE HEAD

BAIRD

Horizontal Chucking Machine

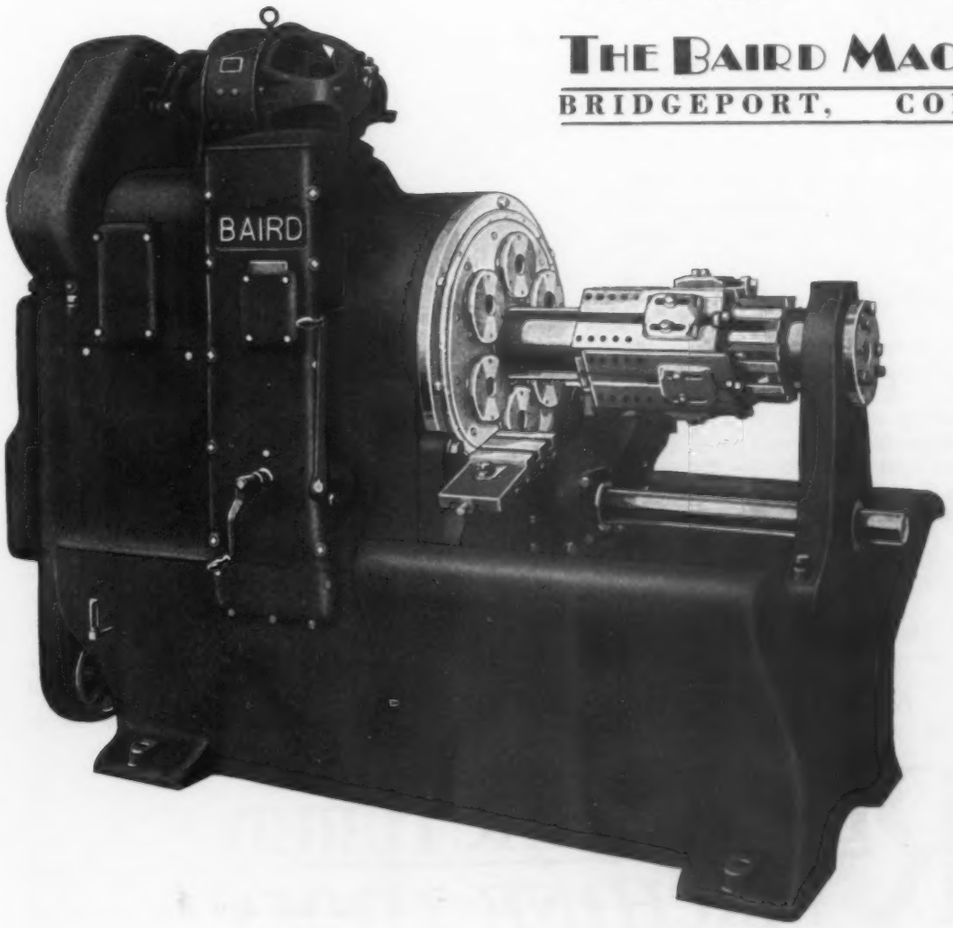
Do you want to reduce the cost of your finished castings and forgings? Do you want to increase production and do better work? A BAIRD Horizontal Chucking Machine will do it for you.

Designed for high production machining of castings and forgings up to seven inches in diameter, this six spindle machine operates on five pieces of work at one time. High speed at one station, low speed at another, or the revolution of a spindle may be stopped to bore one or more holes off-center.

Magazine feeds, cross drilling, milling, turning, facing, chamfering, boring, reaming, threading, and other lathe work.

AUTOMATIC BAIRD MACHINERY

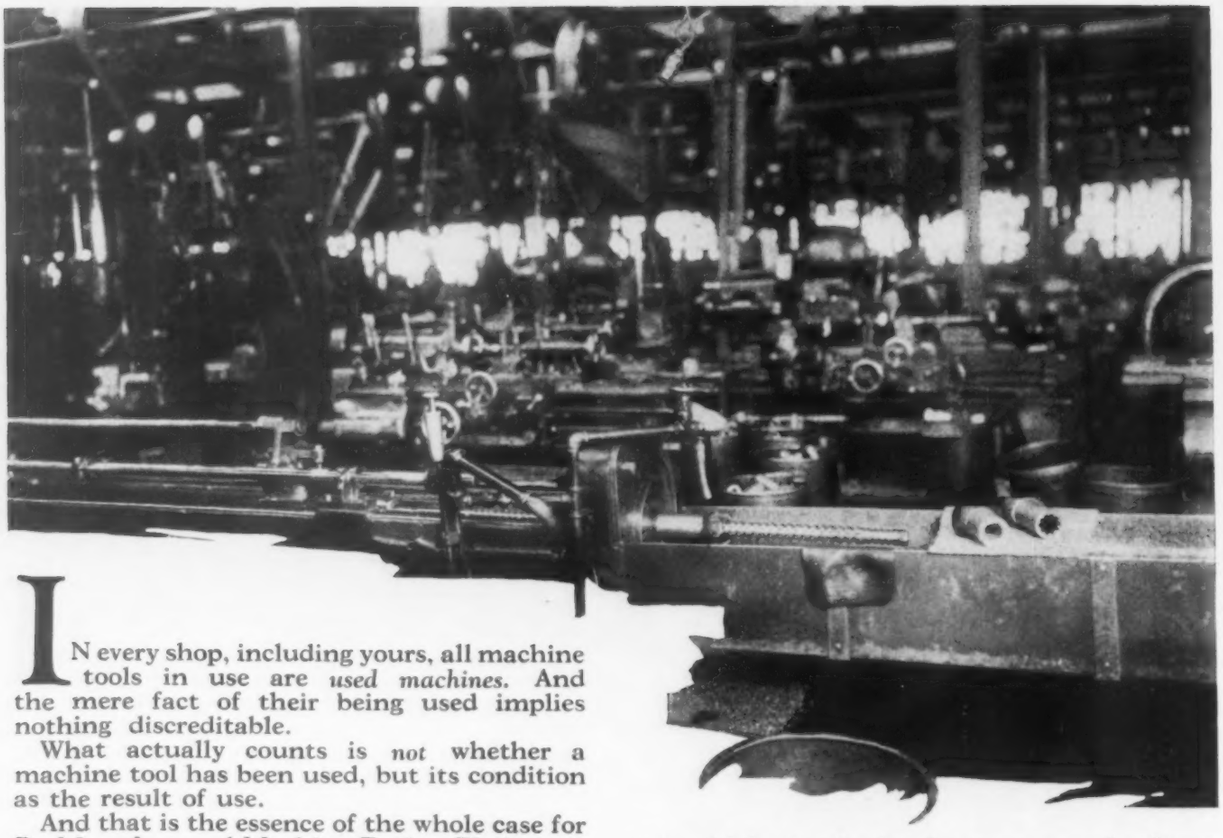
"Ask BAIRD About it"



THE BAIRD MACHINE CO.

BRIDGEPORT, CONNECTICUT

They are All *Used* Machines



IN every shop, including yours, all machine tools in use are *used machines.* And the mere fact of their being used implies nothing discreditable.

What actually counts is *not* whether a machine tool has been used, but its condition as the result of use.

And that is the essence of the whole case for Re-Manufactured Machine Tools. Their condition, after passing through our plant, is such as to assure even the most skeptical that they will produce as accurately and as well as when they first went into service. They are in first-class mechanical condition. What more could be desired of machine tools?

Re-Manufactured Machine Tools must not be confused with ordinary second-hand, "reconditioned" or "as-is" machines. They are distinctly different.

Re-Manufactured Machine Tools are good used machines of current model, restored by our thorough method to a condition comparable only to new. You can put them into your production line with confidence that your high standards of accuracy and volume will be sustained.

Yet you can buy these excellent machines at average savings of 40 per cent off factory prices. Our money-back guarantee is your protection.

On page 211 of this magazine is a list of Re-Manufactured Machine Tools now in stock. Prices, photo prints and complete descriptions will be submitted upon request. Write for "The Why and Wherefore of Re-Manufactured Machine Tools," which describes our process and policy fully.

HILL, CLARKE & CO. OF CHICAGO

Originators of Re-Manufactured Machine Tools

647 W. Washington Boul., Chicago, Illinois

RE-MANUFACTURED *MACHINE TOOLS*

AT a plant of one of the largest electrical equipment manufacturers, a MEAKER FULL-AUTOMATIC PLATING MACHINE reduced plating costs from $1.00 per hundred pieces to 10½c. —*an 89% cost cut.*

At first, plating by hand tank operation was considered adequate. Necessity for a better plating job and increased demand for the product forced the installation of semi-automatic equipment, but even with this machine working at peak capacity, production was still low and the product was not totally acceptable—though costs were lowered to 48c. per hundred pieces.

Their next change was to a Meaker Full-Automatic Plating Machine—production jumped—and *costs were reduced to $0.001 per piece.*

This large saving alone was enough to make the installation very profitable—but there were other important advantages besides: The Meaker Full-Automatic Plating Machine gave and gives *a perfect plating* job and saves valuable floor space.

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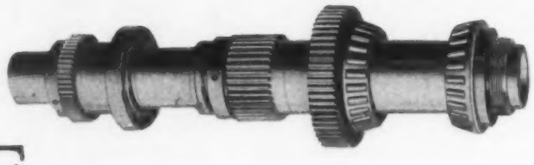

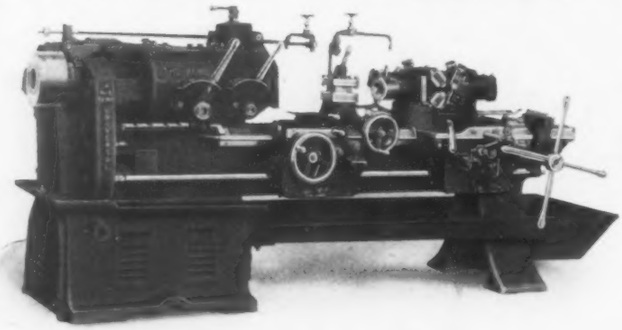

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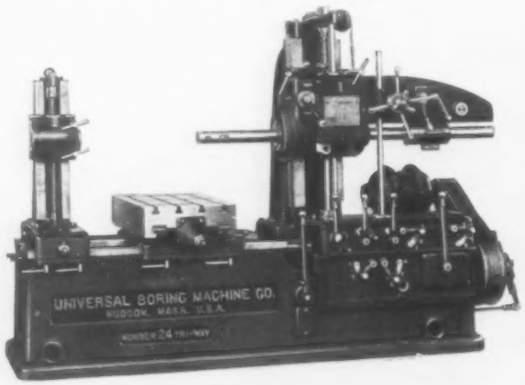
To do accurate work on jigs, tools, fixtures and experimental work



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Use this NATION-WIDE OAKITE *cleaning service!*

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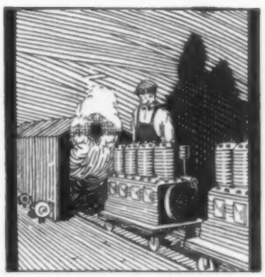

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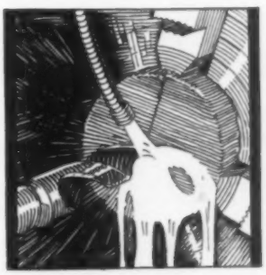
GASOLINE ENGINES, after coming off the test block in an Indiana plant, were washed by hand with naphtha before being painted. It was a time-consuming, hazardous, expensive method. The Oakite Service Man stationed at Louisville hustled down the river to study the problem. Now, with special but inexpensive equipment, designed by our Technical Department, and using a safe, effective Oakite material, the removal of oil and grease from these gasoline engines is accomplished at a great saving over the former method.



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KEEPING TOOL, work, and machine clean is part of the function of a good cutting compound. On the Pacific Coast, a manufacturer of can-making machinery was having trouble with his cutting compound. It gummed up the big turret lathes. It turned rancid, giving off an unpleasant odor. However, these troubles were soon ended . . . when he changed to Oakite Cutting Compound. Now machine, tool, and work stay clean. The compound does not go sour. Improved cooling and lubrication permit higher cutting speeds.

For all cleaning, and for related operations, such as cutting, grinding, rust-proofing, and paint-stripping, use Nation-wide Oakite cleaning service. Available everywhere, and equal to the most difficult cleaning task! Send for booklets on Modern Metal Cleaning, and Modern Cutting and Grinding.

This Advertisement is one of a series based on actual occurrences a. w.

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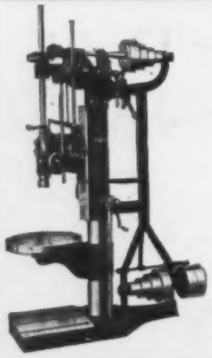

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Modines Provide Cleaner Heating

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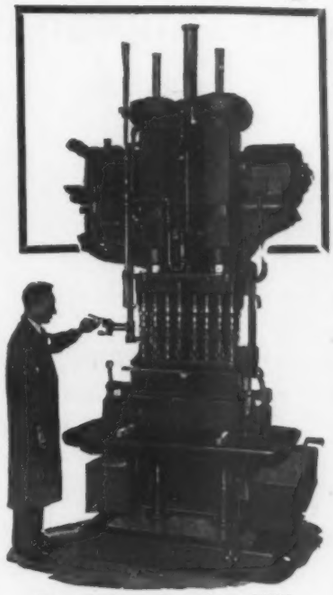
This Honing machine is increasing the efficiency and production in many leading automobile plants. It hones the bore and bearing surfaces in 8 cylinders in from one to two minutes, saving approximately $150 per day on labor alone.



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Helical Gears - Timken Bearings
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One to Six Spindles
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can be furnished in multi-spindle vertical, horizontal and turret type machines. Write for catalogue of these high production machines of ¾" capacity.

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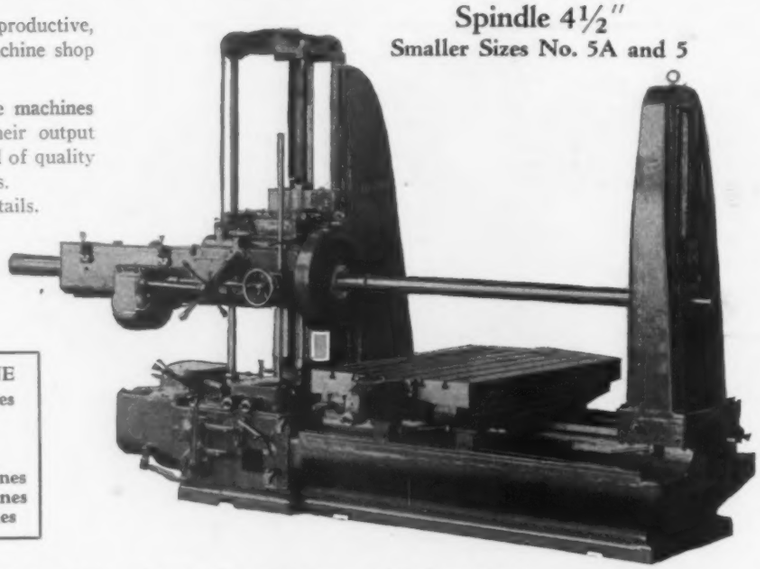

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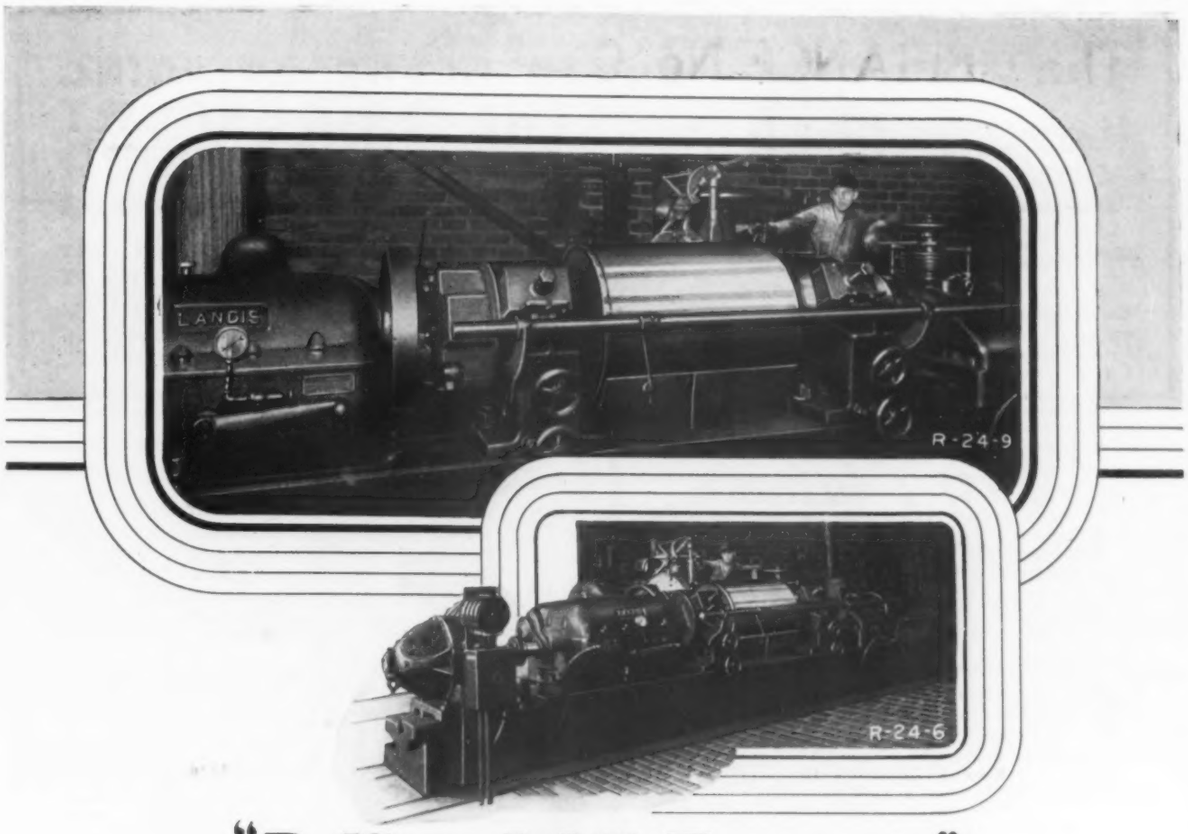

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Tinplate rolls ground in 30 minutes, floor to floor $-\frac{1}{16}$"stock removed at a wheel cost of 20¢. Over four hundred such rolls during the life of the 30" diameter wheel. Only about 1" of metal trimmed from each side of the rolled plate.

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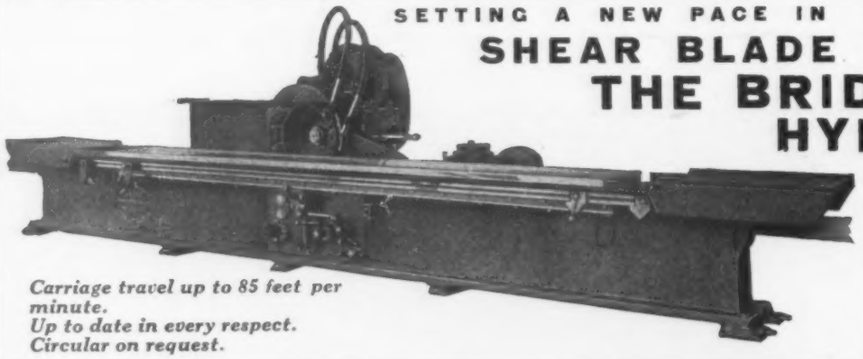

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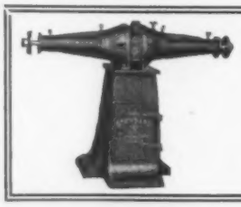

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Combine in a single machine facilities for every possible grinding operation required in a machine shop. Write for Bulletin No. 18.
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(Swings to Horiz. Position when Desired)
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BLANCHARD GRINDERS
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LITTLE LESSONS IN GRINDING COSTS

Maintaining Speed Maintains Profits

"THE ART of grinding has advanced a great deal since I started selling wheels over forty years ago," O. H. Hyde was saying.

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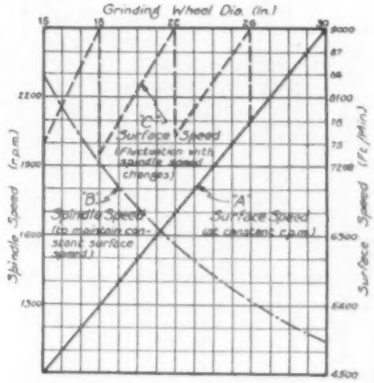
"Now we specify a definite grain and grade and size of wheel with something like scientific precision. We know that, generally speaking, the larger the wheel the less the cost of abrasive.* We know that, within the limits of mechanical and ceramic restrictions, the faster the surface speed of the wheel, the quicker and cheaper the work can be turned out. But we have found out that modern high-speed, organic, bonded wheels *must* be held within narrow limits of speed variation, and must be used on properly designed grinding machines or their advantage entirely disappears.

O. H. Hyde has the longest record of continuous service of all the SAFETY Grinding Specialists. He has been with the Company for 37 years.

What the Chart Shows

"A 30 in. diameter wheel, for instance, at 9000 s.f./min. initial speed will have been slowed down to 4500 ft./min. by the time it is worn down to 15 in. dia., if the spindle speed has not been increased. If the wheel was not too hard to do a good cutting job at 9000 ft. speed, it is entirely too soft for effective grinding at, say, 7200 ft./min., or 20% less than the speed for which it was designed. (*See Curve A on chart*)

"The ideal condition would be to *constantly* increase the rotative speed as the wheel wore down, to maintain constant surface or peripheral speed. (*See Curve B on chart*) Mechanical and electrical limitations make that impractical however,† so the 'Rite-Speed' Grinder is designed to permit—in fact, to *automatically enforce*—the speed to be increased periodically as the wheel wears down (*See Curve C on chart*), so that the maximum variation in the surface speed is never more than 18.1% throughout the life of the wheel.



"That's what makes SAFETY 'Rite-Speed' Grinders pay for themselves in such short order by savings in grinding costs."

\+ + +

Would *you* like to know more about the remarkable "Rite-Speed" Grinders? The positive *mechanical* means by which they control the surface speed of grinding wheels is protected by basic patents. The coupon below will bring you full details. Use it *today*—for greater profit tomorrow.

\+ + +

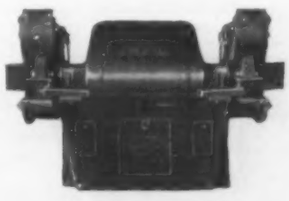
** See third preceding adv. in this series.*
† See next following adv. in this series.
We will send you proofs of both advertisements if you wish.

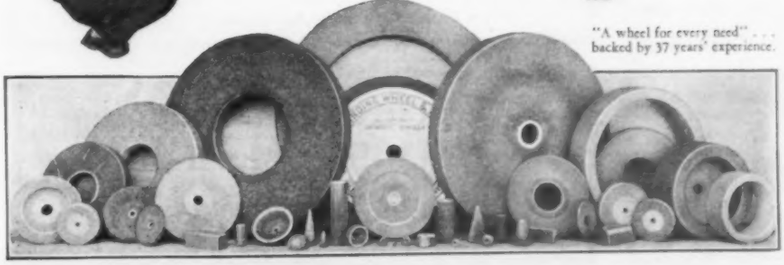
The Safety Grinding Wheel & Machine Company, Springfield, Ohio

The new SAFETY "De Luxe" Portable Grinder has *twenty* superior features, such as extreme ease of wheel change, patented "Interlock" to control speed, perfect visibility, etc. Send for Bulletin S-29-3, which gives full details.

TRADE MARK SAFETY

The SAFETY "Rite-Speed" Grinder automatically *enforces* an increase in speed as the wheels wear down, yet does so *mechanically*, not electrically. This permits the use of a constant speed A. C. motor . . . it can't "run away." Ask for Bulletin F-28-3.





"A wheel for every need" . . . backed by 37 years' experience.

The Safety Grinding Wheel & Machine Co.,
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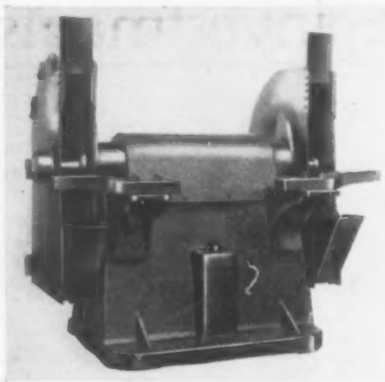

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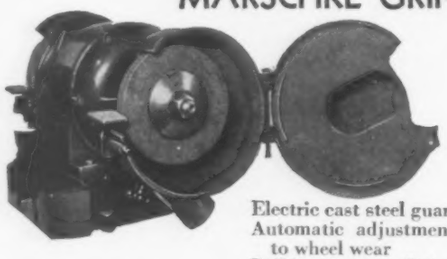
Builders of the Keller Automatic Die Cutting Machine

SAFETY FEATURES of MARSCHKE GRINDERS



Electric cast steel guards
Automatic adjustment of guards to wheel wear
Ball bearings Exhaust ports
Weight—preventing vibration

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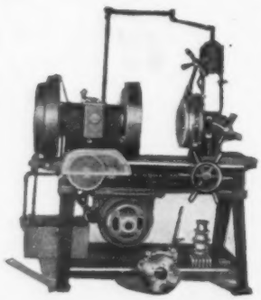

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Equipment: Adjustable Expanding Diehead, Rotary Oil Pump, Reaming and Cutting Off Attachment.

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"Sells" Roller Bearings
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Pipe Cutting and Threading Machines *give* Economy
Hand—Belt—Electric
Ranges ¼-2" to 8-16"

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Most Threads Per Dollar Invested

17 STYLES AND SIZES
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PIPE THREADING for BETTER threads MACHINES
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ELECTRIC DRILLS GRINDERS, BUFFERS

It's high grade if Hisey made. Write for catalog 45-M.

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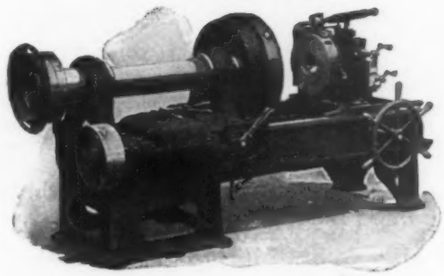

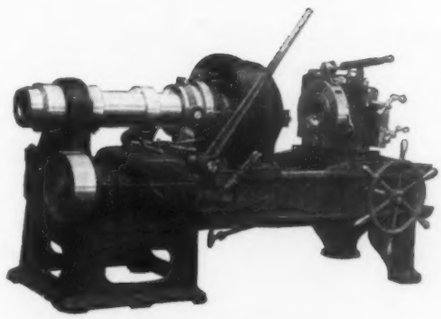

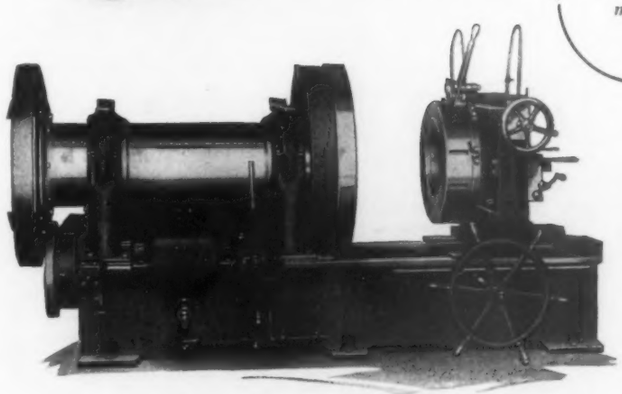

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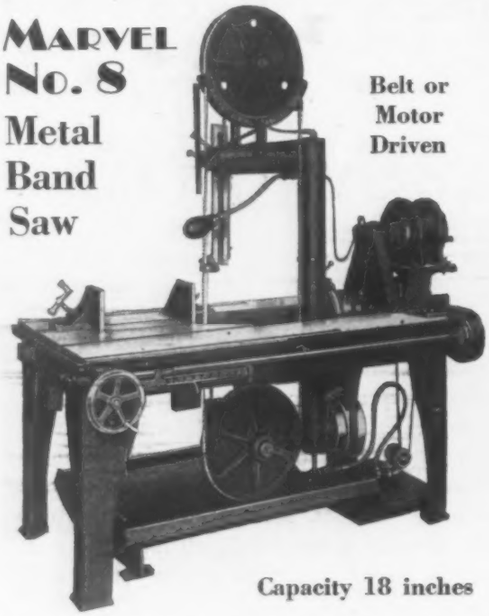
Belt or Motor Driven



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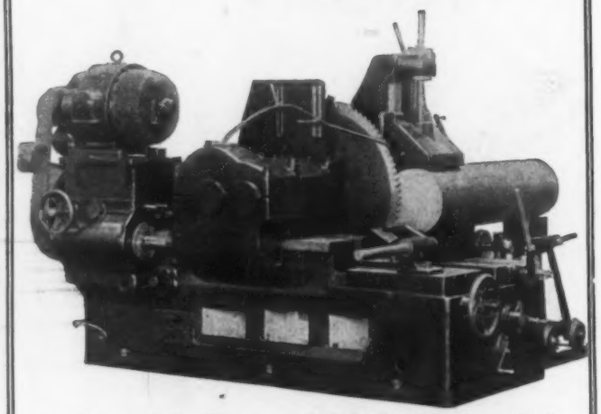

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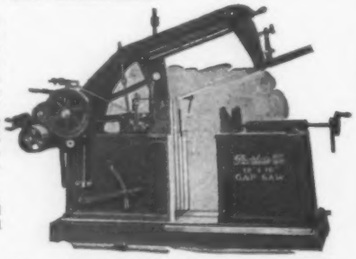
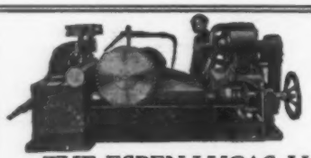


Peerless Machine Co., 1218—16th St., Racine, Wis.
New York Office—15 Warren St.



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Equipped with two tools, cuts twice as fast.
Made in six sizes—two types of drive.
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A Tested Tool from Shank to Point

The Morse Line includes:

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THE exhaustive testing and inspection which goes into the making of a Morse Drill might impress the layman as unnecessary expense to be added on to the cost of the tool.

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TWIST DRILL & MACHINE COMPANY
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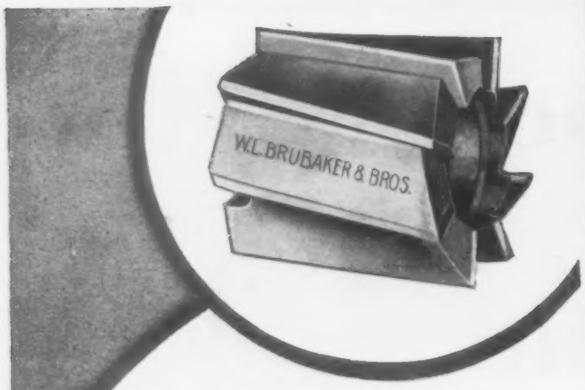

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THE milling cutter of yesterday would sadly handicap the production possibilities of the modern milling machine.

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Brubaker Shell End Mills are designed to get the most from your modern millers. They cut smooth, clean and fast. Carefully tested steels insure long service life. Correct heat treatment gives more production between grinds.

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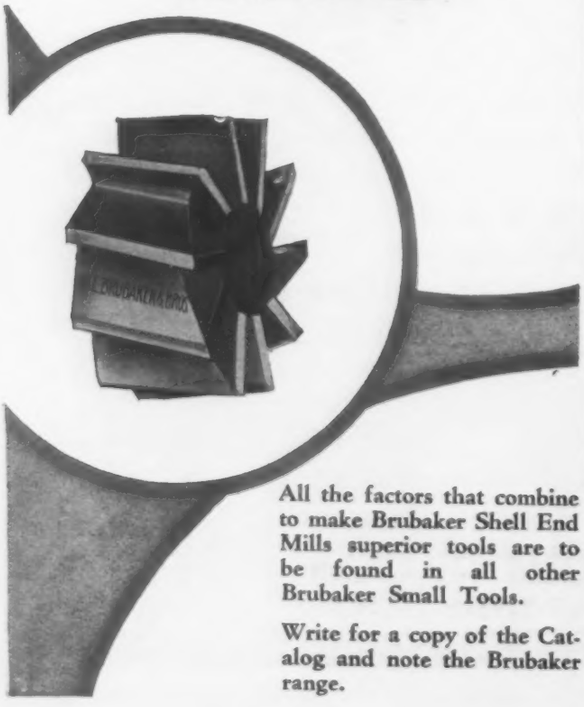

All the factors that combine to make Brubaker Shell End Mills superior tools are to be found in all other Brubaker Small Tools.

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Suitable for Boring Mills, Planers and Heavy Duty Lathes

The holder supports the bit as near the cutting edge as possible, taking practically all of the strain.

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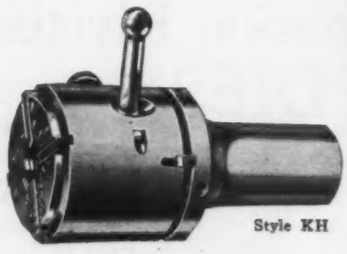
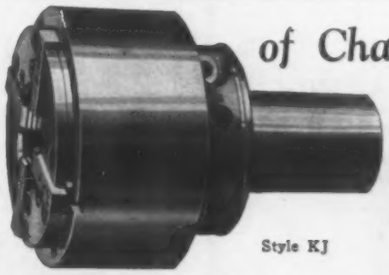
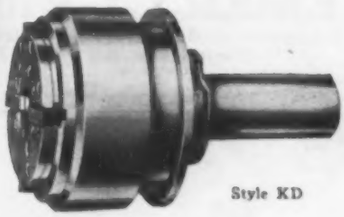

Style KH


Style KJ


Style KD

K LINE

The Geometric K Line of Die Heads offers you complete chaser interchangeability tool size for tool size for a varied range of machines. Pictured above is the Style KD—a Rotary Head for live spindles; the style KH—a hand Die Head; and the new Solid Adjustable Head, the Style KJ.

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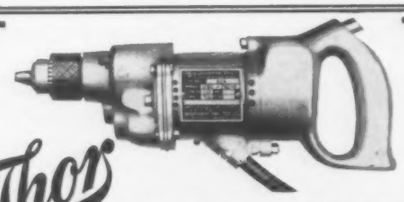

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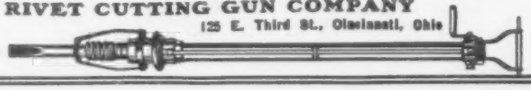

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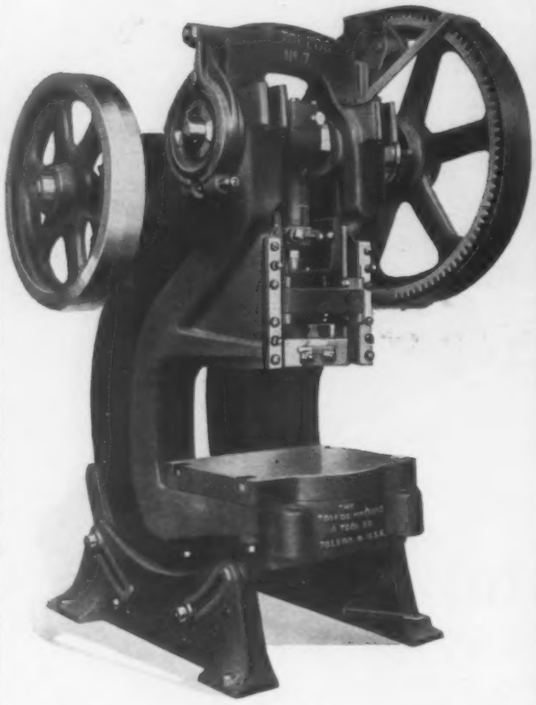

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PRESSES FOR EVERY PURPOSE

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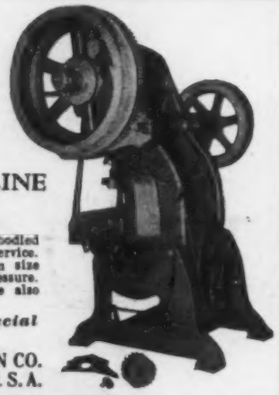

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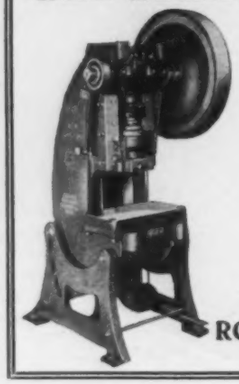

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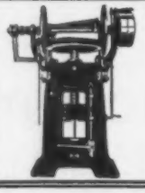

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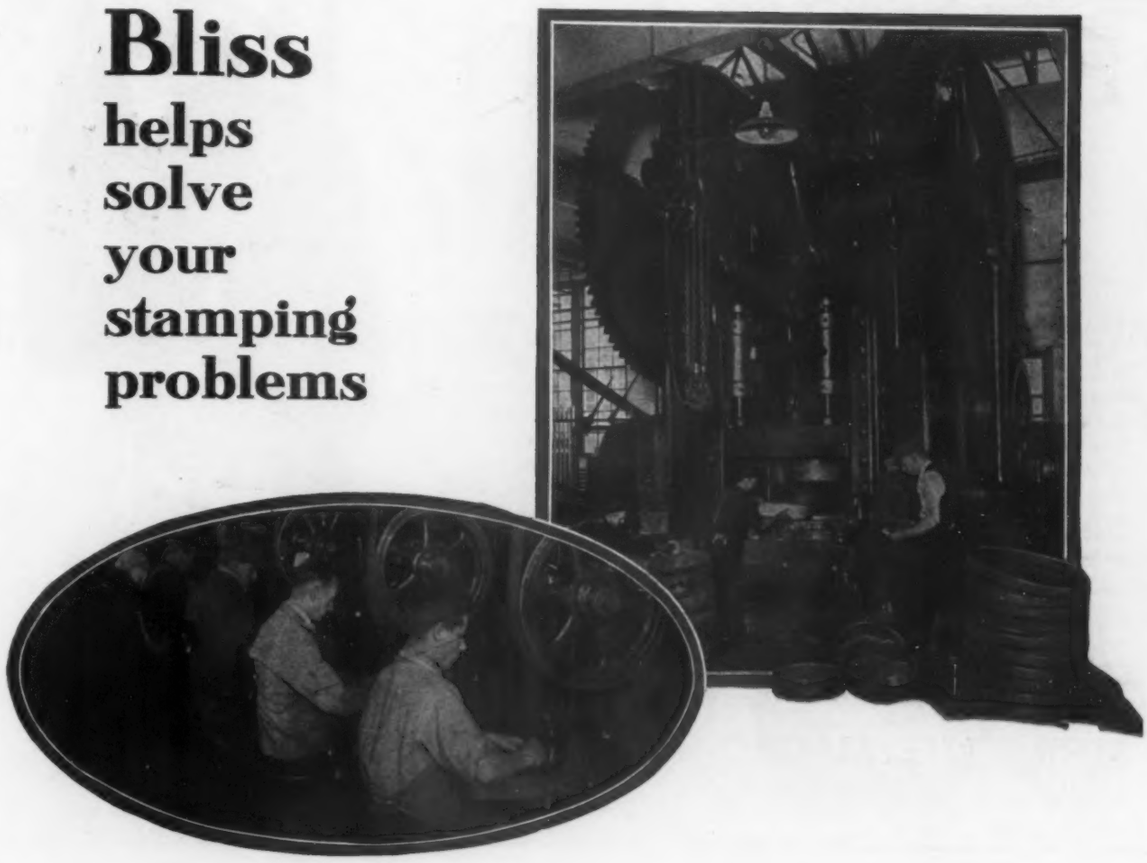
Bliss helps solve your stamping problems



IN many cases Bliss engineers have found a simple, economical and speedy method of performing operations that had previously been considered unavoidably laborious and costly.

Whether your sheet metal operations involve blanking, drawing, punching, piercing, stamping, or embossing light or heavy gauge parts in any size or shape, the extensive experience of the Bliss engineers can be of real help to you.

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No. 561

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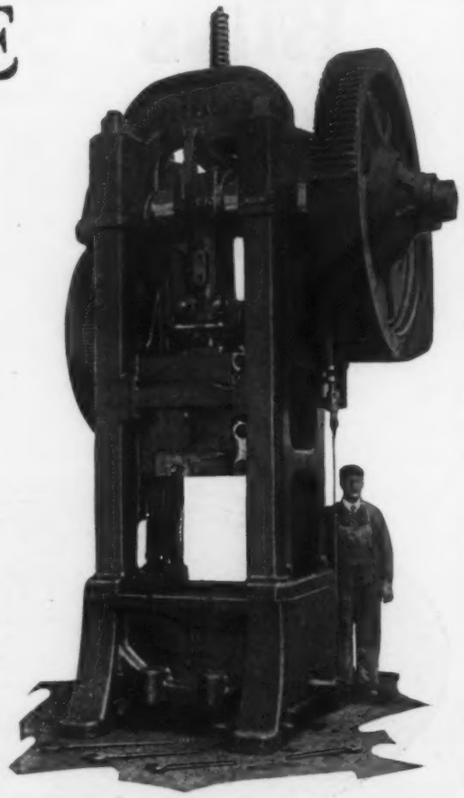
FOR METAL STAMPINGS



The cut shows Ferracute Press D.G. 301, capable of exerting 300 tons pressure. Features include: Tie Rod Construction, Ram Balance, Jaw Clutch, Direct Motor Drive, Sheet Metal Gear Guards, Ram Knockout; this machine is arranged for motorized ram adjustment. The Ferracute lines include models in types and sizes to handle all classes of work. Ferracute engineers will gladly cooperate in solving your press-work problems *most profitably.*

Sixty-seven years' experience in designing and building presses for cutting and forming metals.

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Littell's Automatic Feeds will Triple Production of hand-fed punch presses on many operations, and increase the output on some ten fold. They can be used on all makes of punch presses. Write for full particulars.

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Extrusion Presses, Lead Encasing Presses, Platen Presses, Moulding Presses, Hydraulic Pressure Pumps and Special Machinery. See our advertisement in the second issue, each month.

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Crushing Machinery	Hydraulic Presses	Special Machinery
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All Parts of Forged Steel
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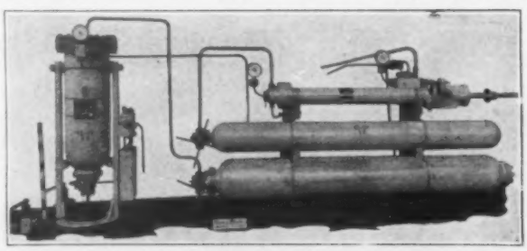

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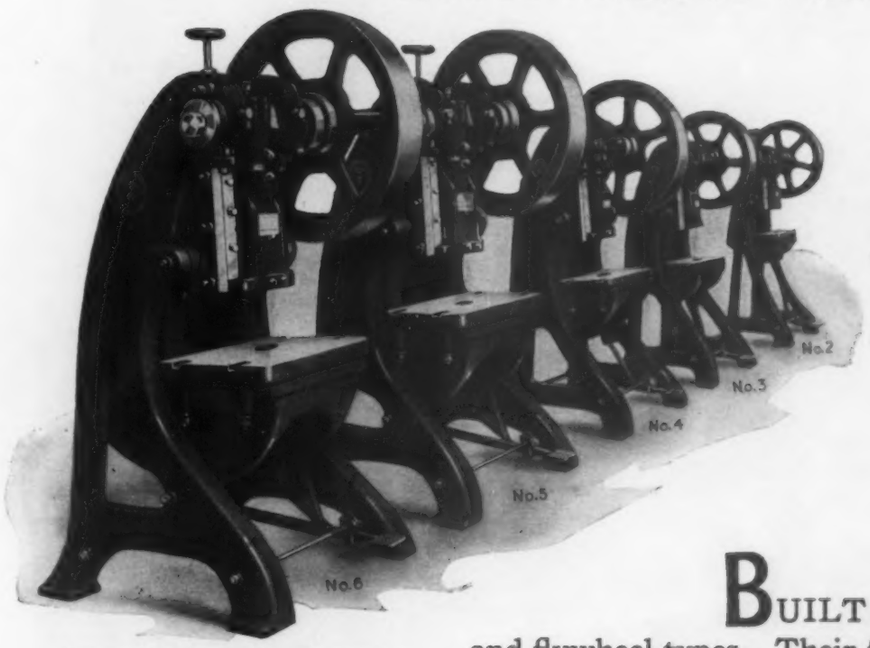
INCLINABLE OPEN BACK POWER PRESSES WITH FRONT ADJUSTMENT



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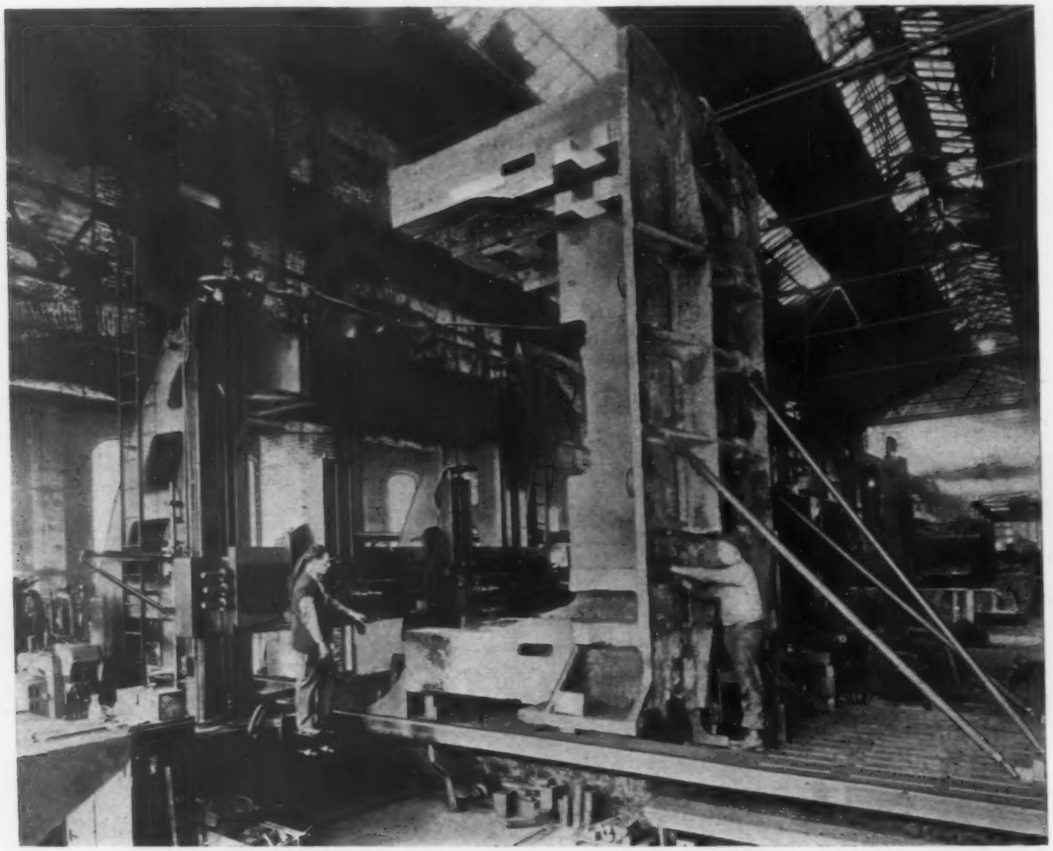

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SPEED SAFETY ECONOMY in Pressing Operations

THE new H-P-M HYDRO-POWER Press is establishing new speed and low-cost records in scores of metal-working plants throughout the country. Incorporating new features of design, this press has the speed of the mechanical press combined with the smoothness and flexibility of the hydraulic press.

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If your work includes any of the above operations, it will pay you to investigate the advantages and economies of this new press. Our engineers will gladly study your pressing problems and submit a recommendation without obligation.

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The Hydraulic Press Mfg. Co.

Columbus, Ohio Factory: Mount Gilead, Ohio

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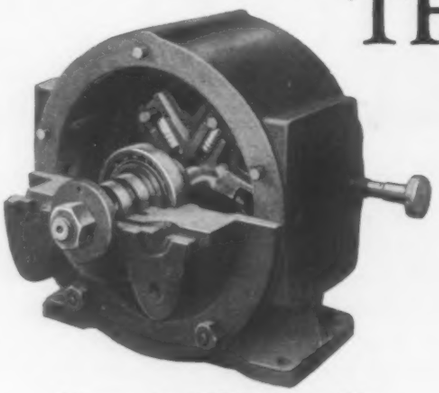
Standard Equipment— THE HELE-SHAW

Hydraulic Pump



Cut away view of High Pressure Hele-Shaw Hydraulic Pump

Send for catalogue describing the Hele-Shaw Hydraulic Pump and its applications.

Hele-Shaw Hydraulic Pumps are standard equipment on a wide variety of presses, machine tools and special machinery.

These pumps provide a means of applying hydraulic power. They insure fast, smooth operation, combined with the utmost flexibility and ease of control and tremendous power for overcoming peak loads and unusual resistances.

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Tool breakage is greatly reduced when Hele-Shaw Pumps are used. Elaborate electrical controls and safety devices are eliminated.

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ROTARY SHEARS

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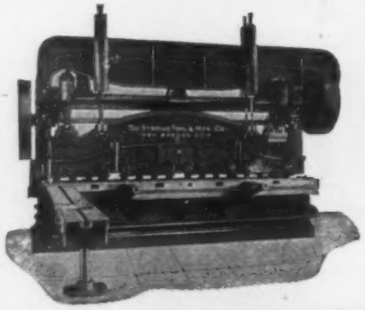

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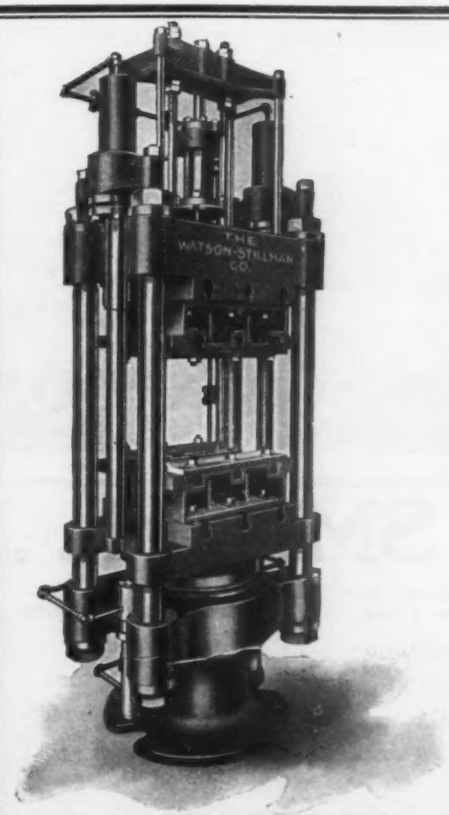

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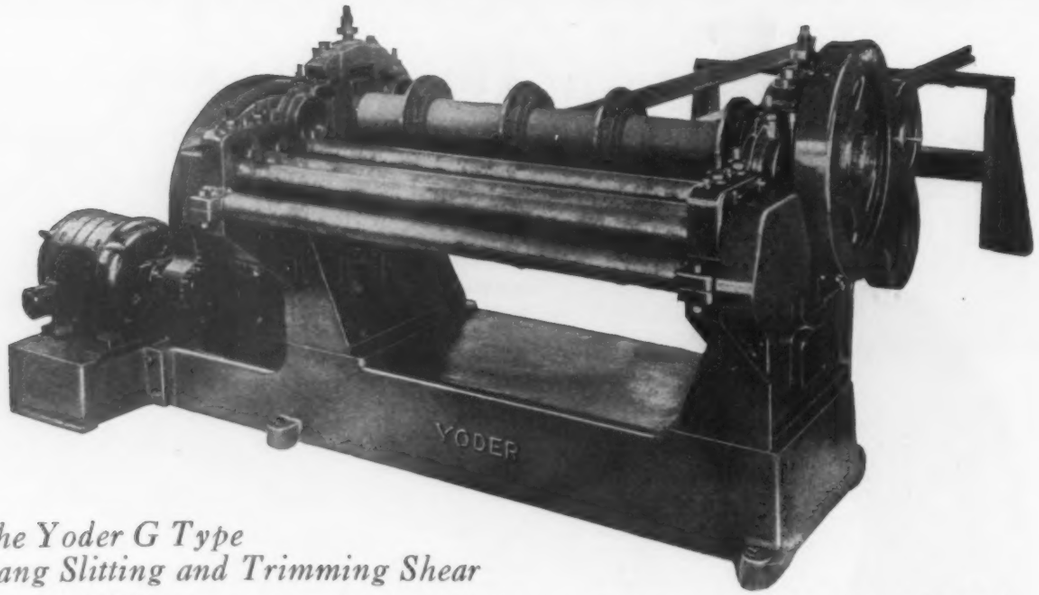

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MOUNTED on self contained base of heavy construction. Has threaded mandrels, and cutters made in halves to clamp around the mandrel, affording easy, quick and accurate adjustment. The machine is provided with pinch and feed rolls, and a set of five leveling rolls. Cutters can be added or removed from the mandrel without removing the mandrel from the housings, and adjustment or spacing of the cutters can be made without removing the cutters from the mandrel.

All parts are easily accessible, and quick and accurate adjustment of the cutters can be easily made.

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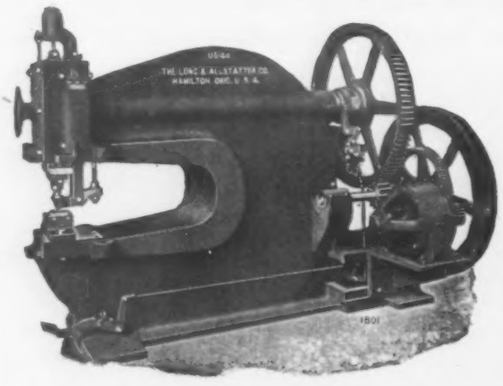

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Power Punching and Shearing Machinery

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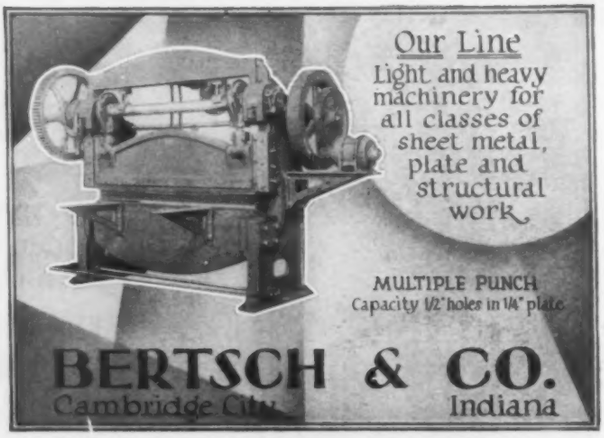
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Light and heavy machinery for all classes of sheet metal, plate and structural work
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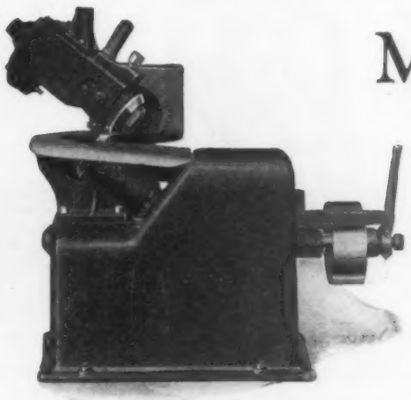
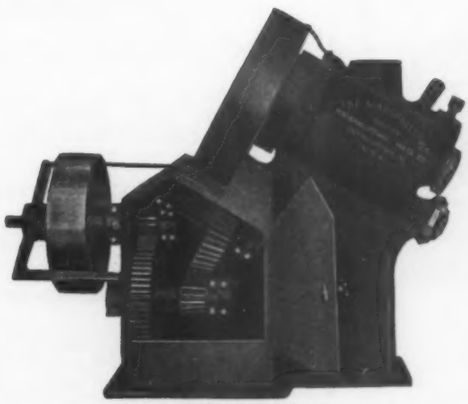


Throatless Shear No. 112

Marshalltown Shears built for those who demand the best



Standard Bevel Shear

Marshalltown Shears are designed by engineers who know sheet metal working—built by mechanics who are equally well informed as to the necessary requirements through years of experience—and are built of materials selected for their merits—not for low prices or easy machinability.

When better products are required of the sheet metal workers—they realize the importance of the best in modern equipment—Marshalltown Equipment.

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All types of Circle Shear Blades

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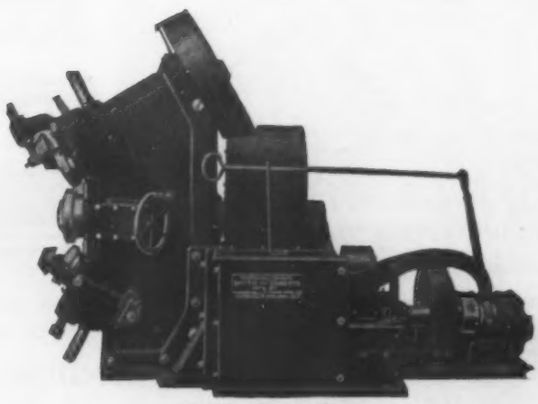

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The Beatty Vertical Bulldozer

This Beatty Machine gives the greatest possible clear working space, with ample die-room for two or more set-ups. All parts are well proportioned to give strength and rigidity. The ram is counterbalanced, and the double friction clutch gives an immediate stop and reversal at any point.

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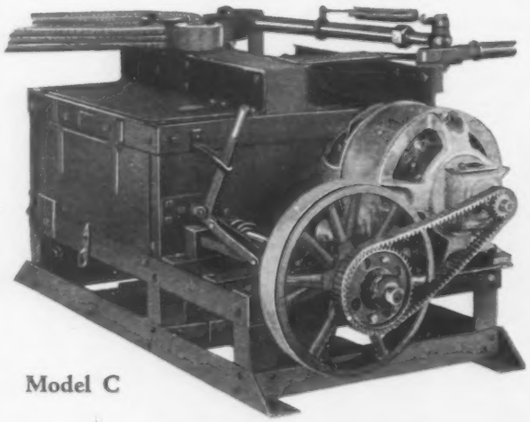

Model C

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Circles of any size required in reinforcing work from 18" in diameter up can be made on this bender. Changes of radius can be made in the same circle, without stopping machine with lever adjustment. Where speed and large capacity are required this machine will give unfailing satisfaction. It is the right machine for the fabricator having a heavy tonnage of reinforcing circles. As high as five one-half inch Bars can be bent in one operation.

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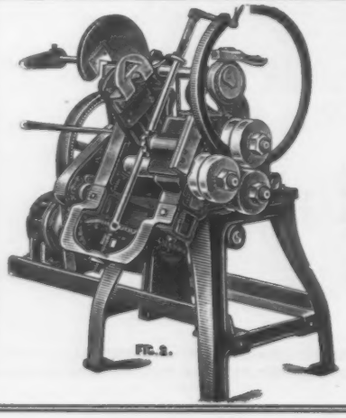

CIRCULAR ANGLE BENDING MACHINE No. 14

Capacity up to 2 in. Angle Iron 10 in. to 10 ft. circles
With or without cut-off attachment; belt or motor driven.

True circles can be formed on this Machine free from twist.
We are designing a Machine to bend into circles, U or S shape, 4" x 4" angle iron or under.
Your inquiries solicited.
Also manufacturers of Automatic Grinding and Polishing Machines, Crushers, Pulverizers, Power Shears, Presses, Punches, Brakes, etc.

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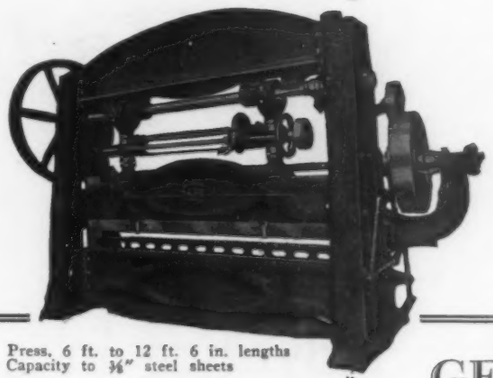
What you can do on this OHL-10 Ft. Power Brake



Press, 6 ft. to 12 ft. 6 in. lengths
Capacity to 3/16" steel sheets

—Bend a ten-foot sheet of No. 10 gauge steel—or, form skylight bars of No. 26 gauge steel in two operations. The seven members are bent in one operation and the bar squeezed together in the next.

This OHL Power Brake is equipped with a new method of holding dies, is amply proportioned, and heavily constructed, and includes a patented friction gear.

We'll be glad to go over this machine with you point for point and explain how economical—and simple—it is to operate.

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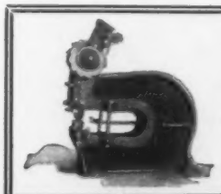

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WITH the introduction of the new Type W-17 Welding Blowpipe, Oxweld again raises the standards of blowpipe performance.

New principles are incorporated — valuable old principles refined. The result is an entirely new general utility oxy-acetylene welding blowpipe.

The W-17 is light in weight and perfectly balanced. It enables continuous welding without fatigue. It will not backfire. It provides intense heat over a greater area. The goose-neck head facilitates welding in difficult positions.

The W-17 incorporates, of course, the Oxweld low pressure injector principle—assuring maximum economy and efficiency.

Examine the new W-17 carefully at the first opportunity. Write today for detailed information.

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WELDING AND CUTTING APPARATUS AND SUPPLIES

Reliable, Economical, Long Lived—
Typically Oxweld

OXWELD ACETYLENE COMPANY

Unit of Union Carbide UCC *and Carbon Corporation*

NEW YORK

SALES OFFICES IN PRINCIPAL CITIES
IN CANADA: DOMINION OXYGEN CO., LTD., TORONTO

STOP!

Regulator Repair Expense at the Source — *by Specifying* the New Harris

MULTI COPYRIGHTED **STAGE**

REGULATORS

Approved by The Underwriters

PATENTED
OTHERS PENDING
U. S. A. AND
FOREIGN COUNTRIES

The terrific abuse of regulator seats, so common with ordinary regulators, is the greatest source of regulator repair expense. By reducing the pressure in two stages the Harris MULTI-STAGE regulator keeps the seat in perfect condition indefinitely. Better welding flames at lower cost. Investigate this new principle of gas pressure regulation.

Ask for Bulletin No. 11

HARRIS CALORIFIC CO., Cleveland, Ohio

(Oldest makers of Gas Welding and Cutting Apparatus in U. S. A.)

Oxy-Acetylene Torches, Regulators, Acetylene Generators, Gasavers, Valves, Manifolds

"Here, Lad—

I have several additional features in mind to incorporate in our machine that would make it a hummer.

The only trouble is that it will necessitate asking more money for it.

Let's think it over."

"No, Pop—

Let's *put* it over.

Lincoln Application Sheet No. 60 shows how my friend 'Arc-Welding' helped a manufacturer do just what you want to do and it didn't cost a penny extra.

This particular manufacturer changed his Feed Mill from cast iron to rolled steel construction and made a better mill that sells for the same price.

The buyer profits from getting better value for his dollar and the maker profits first from the betterment he offers without soaking the customer for it, and second from using the most efficient arc welder — the Lincoln 'Stable-Arc'.

They say that a dollar doesn't go so far today, but the 'Stable-Arc' makes it go all the way."

The Lincoln Electric Co.
Dep't. No. 19-4 Cleveland, O.

TRADITION

PROGRESS

The Lincoln "Stable-Arc" Welder

— welds easier
— makes better welds
— permits greater output because of the steady uniform arc throughout entire welding range, which is the result of:

Variable voltage design
Laminated magnetic circuit
Separately-excited generator field
Double control of welding heat
All steel construction

No other welder has all these features.

"Stable-Arc"

LINCOLN WELDER

W-138

PRODUCTION OR MAINTENANCE WELDING AND CUTTING

Whether your problem is an unusual one such as welding a ring for a smokestack, or a usual one such as cutting a riser from a steel casting—

Whether it is the production of many, a few, or one unit of joined or cut metal—

Whether it is the repair of a broken machine part or the hard surfacing of worn tools—

Airco complete line of oxyacetylene products if used according to Airco Service Engineers recommendations will solve the problem to your complete satisfaction.

A phone call or a line to any Airco office listed will bring further information.

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342 Madison Avenue, New York

Airco Oxygen—Airco Acetylene—Airco-National Carbide—Airco-Davis-Bournonville Welding and Cutting Apparatus—Supplies

90 Plants *115 Distributing Stations*

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Airco Products will be exhibited at the Detroit All-American Aircraft Show, Detroit City Airport, April 5-13, in Airco Booths 3 and 5 Young Airway

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640 BAGLEY AVE.
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SPOT—BUTT—SEAM
PROJECTION—FLASH
AND SPECIAL TYPES

We maintain a staff of experienced sales engineers and service men in all important industrial districts.

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LYNN, MASS. BAY CITY, MICH.

Wire-Working Machines and Wire Mill Equipment

Machinery for
- SPRING MAKING
- WIRE DRAWING
- LOCK WASHERS
- NAILS AND STAPLES
- CABLE ARMORING
- &c., &c., &c.

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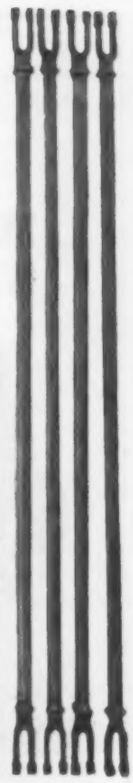
AGNEW WELDERS
ELECTRIC SPOT, BUTT & SEAM WELDERS
STANDARD & SPECIAL
WIRE WELDERS A SPECIALTY
AGNEW ELECTRIC WELDER CO.
Manufacturers of Electric Welding Machines since 1905
MILFORD, MICH.

COOK CAP SCREW MACHINES
for shaving CAP SCREWS under and over the head in one operation.
COOK WOOD SCREW MACHINES
For making IRON AND BRASS WOOD SCREWS.
THE ASA S. COOK CO., HARTFORD, CONN.

WIRE STRAIGHTENING AND CUTTING MACHINES
Timken Roller Bearings—Texrope Motor Drive
Sizes up to ½"—Built for Hard Service
THE LEWIS MACHINE CO.
1600 E. 24th STREET, CLEVELAND, OHIO

If a company in your line has found a better way of doing a thing, the probabilities are that your business paper tells about it.

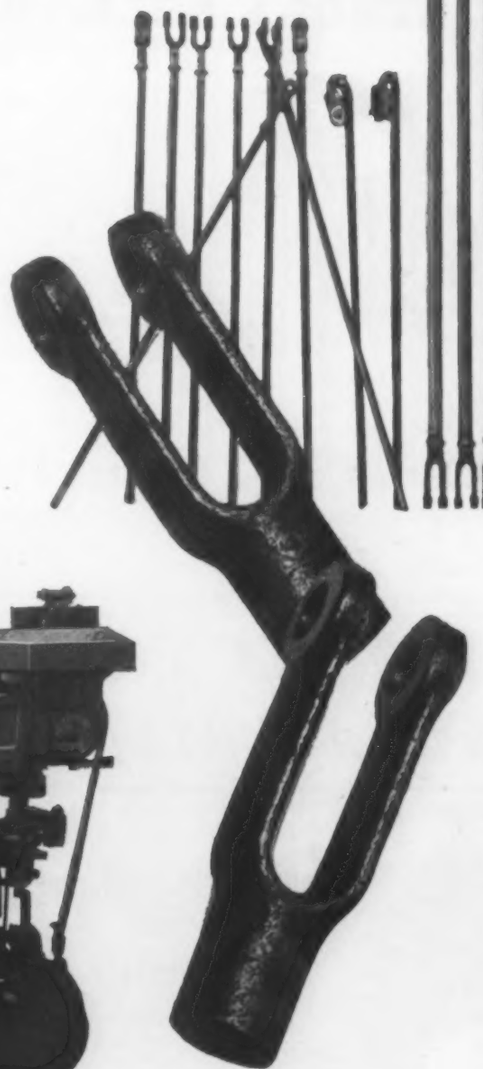
FEDERAL AUTOMATIC
. . . BUTT WELDING . . .

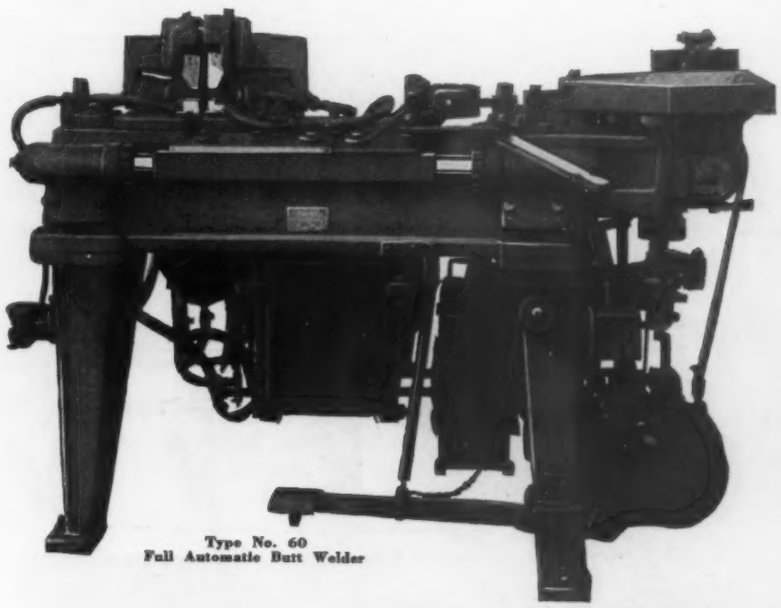


DROP forged clevises and rolled bar stock are welded together automatically in this FULL AUTOMATIC TYPE No. 60 BUTT WELDER at a rate of 650 welds per hour, which means a *finished product* at a *minimum cost*.

Call on Federal Engineers for free advice on your welding problems. Federal experience and skill in the welding field is at your service.

Buy Federal Welders for quality welding at fair prices.





Type No. 60
Full Automatic Butt Welder

Federal Welders
BUTT
SPOT
SEAM

FEDERAL MACHINE & WELDER CO. Dana Avenue, Warren, Ohio, U. S. A.
Branch Offices In All Principal Cities

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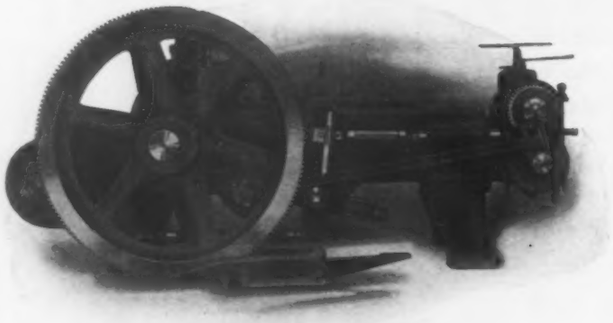
MANVILLE
750-C
HIGH SPEED DIRECT ACTING DOUBLE-STROKE SOLID-DIE COLD HEADER



A POWERFUL HEADER FOR COLD FORGING CAP, LAG, MACHINE SCREW BLANKS AND SPECIAL HEADINGS

750-C Double Stroke Solid Die Cold Header—Capacity ¾" x 5"

The E. J. Manville Machine Company

Builders of High Grade Automatic Machinery at **Waterbury, Ct.**

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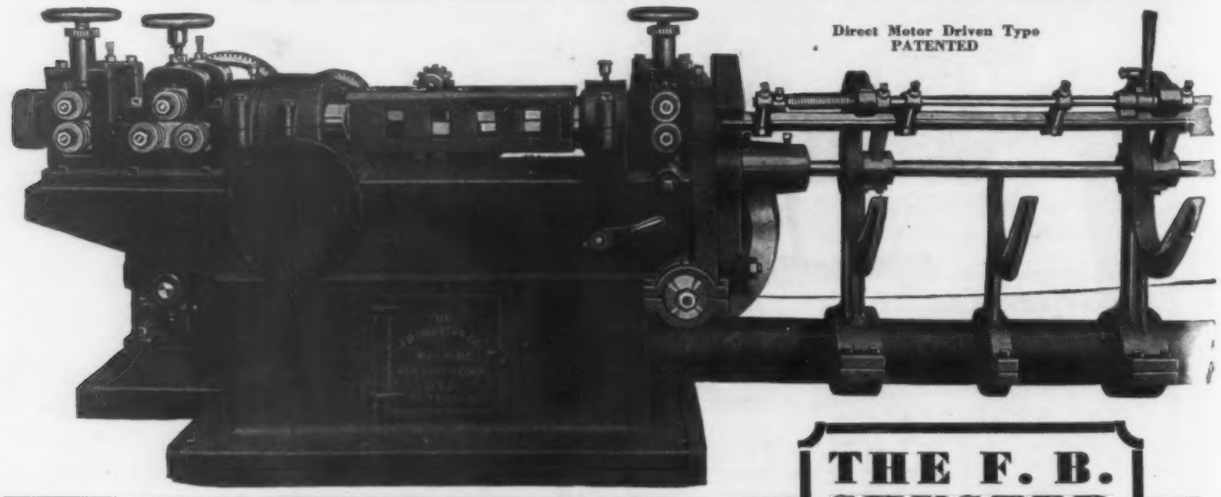
SHUSTER *Straightening and Cutting Machine for Round Stock*



Direct Motor Driven Type
PATENTED

A self contained Machine—makes the stock perfectly straight, and cuts absolutely accurate lengths. A substantial machine, which runs 24 hours a day and stands up to it permanently. A simple machine, which can be operated by unskilled labor, showing a large profit in a few weeks. Catalogue?

THE F. B. SHUSTER COMPANY
NEW HAVEN, CONN.
Straightener Specialists Since 1866

Hallden

Flying Shear Automatic Wire Straightening and Cutting Machine

Patents Pending

For handling all kinds of ferrous and non-ferrous wire. The wire does not stop while being cut off, thus producing an absolutely uniform diameter rod from end to end, free from markings or bulges. It is not necessary to stop the machine when starting or finishing a coil of wire, due to our specially designed straightening flyer. The rods are cut to accurate length at a speed of 100 feet per minute. Each size machine will handle a wide range of wire diameters. Rotary flyer made of .50 carbon machinery steel. All fast running parts mounted in heavy duty ball bearings.

Write for full particulars

Hallden Machine Company

THOMASTON, CONN.

WATERBURY-FARREL RIVET HEADERS

··SET·A·NEW·PACE··

A high speed single blow cold header that will upset 3/16" and 1/4" rivets, 1/2" to 1" long, at the almost unbelievable rate of 275 per minute.

Think of it, 4 rivets in less than a second, faster than you can count. Our 3/8" header will do 250 a minute.

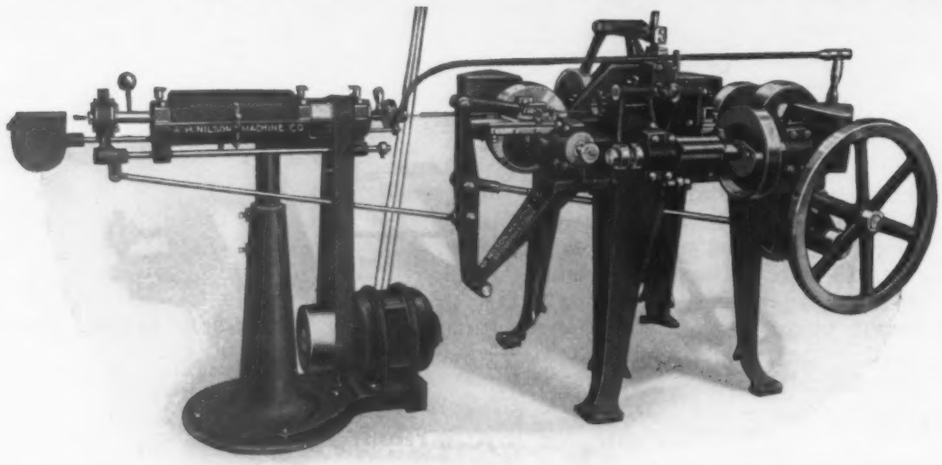
The Waterbury Farrel Foundry and Machine Company

COLD PROCESS BOLT, SCREW, RIVET, NUT AND SPOKE MACHINERY

Home Office and Works: Bank and Meadow Sts., Waterbury, Connecticut

Western Sales Office: 736 Bulkley Building, Cleveland, Ohio

The NILSON
FOUR SLIDE WIRE FORMING MACHINE



THIS is the latest improved Nilson Four Slide Machine, connected with an Oscillating Wire Straightener which can be driven either by a motor or countershaft. The Roll Straightener is most commonly used, but if the wire must be perfectly straight it is necessary to use an Oscillating Straightener. The arbor, in the Straightener illustrated, is so constructed that it is only necessary to insert the end of the wire in it, then push the wire, and it will go through the arbor block itself and come out straight, providing the blocks are properly adjusted. Manufacturers have long felt the need of a portable Straightener of this kind, which can readily be moved from one machine to another as required.

THE A. H. NILSON MACHINE COMPANY - - Bridgeport, Conn.

Fifty Years of Experience

To Economize and Improve Your Swaging Operations

The Langelier Way

Rotary swaging with Langelier equipment assures the absolute minimum of cost and the maximum of speed, accuracy and scope. Convenience of control and modernity of design eliminate one of the two operators required by less up-to-date methods, and material can be swaged for roundness, straightness and tolerance within ± .001 without metal being removed or wasted.

In addition, Langelier (rotary) swaging improves the structure of the metal, makes it denser, increases its tensile strength, elastic limit and toughness. Our estimates for reducing, tapering or pointing, hot or cold, solid or tubular materials will reveal savings of real interest. Send samples or blueprints; no obligation.

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American Optical Co.
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LANGELIER MANUFACTURING CO., Providence, R. I.

Designers and Builders of Hot and Cold Swaging Machines, Hammering Machines, Sensitive Drills, Multiple Spindle Drilling and Tapping Machines, Multiple Spindle Attachable Drill Heads, Automatic Drilling and Tapping Units.

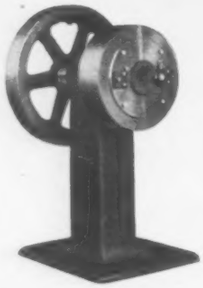
PEAK PRODUCTION with ETNA SWAGING MACHINES in the BLAW-KNOX PLANT PITTSBURGH

Below is shown a HOT swaging operation in which solid, soft steel rods, 1½ in. diameter, are brought down to a sharp point within two inches. This is a superior and faster method.

THE ETNA MACHINE CO.

(WRITE FOR ESTIMATES TO EQUIP YOUR PLANT)

TOLEDO, OHIO



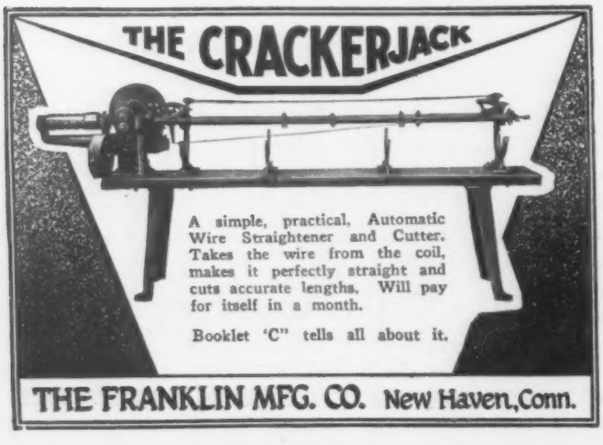
THE
DAYTON
TORRINGTON
SWAGING MACHINE

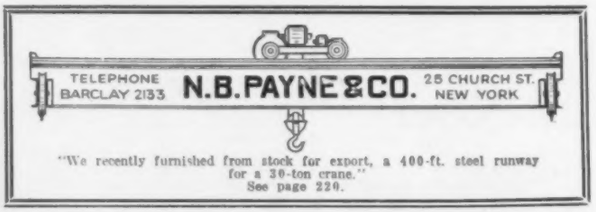
—with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Modern Art of Swaging."

The Torrington Co., Excelsior Plant
55 Field Street Torrington, Conn.

A COMPLETE LINE OF PORTABLE CONVEYORS
A MACHINE for EVERY HANDLING SERVICE
WRITE FOR CATALOG
PORTABLE MACHINERY CO. CLIFTON, N.J.

Owen Buckets
Stronger and Built to Last Longer, Owen Buckets get "A Mouthful at Every Bite" and More Bites Per Day.
OWEN BUCKET CO.
6011 BREAKWATER AVE. CLEVELAND, OHIO


THE CRACKERJACK
A simple, practical, Automatic Wire Straightener and Cutter. Takes the wire from the coil, makes it perfectly straight and cuts accurate lengths. Will pay for itself in a month.
Booklet 'C" tells all about it.
THE FRANKLIN MFG. CO. New Haven, Conn.


TELEPHONE BARCLAY 2133
N.B.PAYNE&CO.
25 CHURCH ST. NEW YORK
"We recently furnished from stock for export, a 400-ft. steel runway for a 30-ton crane."
See page 220.

We've taken these movies for you

To give you a true picture of bucket performance, we have filmed many reels of Haywards at work. Each picture is a convincing record of the speed and vigor behind Hayward action. Each film tells more in a foot than still-life photos ever can.

Hayward Electric Motor Clam Shell Buckets star on the job. With an assurance that reflects long experience and satisfactory service, they respond to instant direction. Their action is smooth, their grip sure and their performance is always accomplished with a minimum of effort.

We have many reels that will show you Hayward Buckets at work. Come and see these movies the next time you are in New York. We'll gladly arrange for a private showing whenever it is convenient.

Having four different types of digging and rehandling buckets to draw from, makes a Hayward recommendation absolutely unbiased.

THE HAYWARD CO.
46-50 Church St., New York, N.Y.

HAYWARD ELECTRIC MOTOR CLAM SHELL BUCKETS *in* FOUNDRIES AND INDUSTRIAL PLANTS

Handling a full load of foundry sand on every trip is easy for this Hayward.

A Hayward Electric Motor Bucket delivering coal to the bunkers in the boiler room.

This Hayward makes short work of unloading cars outside the plant.

HAYWARD BUCKETS ALL THE WORLD OVER TRADE HAYCO MARK

ELECTRIC MOTOR
ORANGE PEEL
CLAM SHELL
DRAG LINE

Hayward Buckets

PACEMAKERS

It's no secret that the major problem of business is to build your product at a salable price—at a profit.

Webb Conveyors are setting the pace for high production and low cost in the plants of more than fifty industrial leaders.

Webb engineers are available to help you solve the problem of moving any material easier, faster—at less cost.

Consult them.

JERVIS B. WEBB COMPANY

CONVEYOR ENGINEERS AND MANUFACTURERS

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AMERICAN "HY-HOOK" CRANES & HOISTS

AMERICAN CRANE

First to be equipped with roller bearings.
First to be equipped with hardened steel pinions and forged steel gears.
First to adopt all-steel arc welded construction.
The three distinguishing features of all modern cranes.

THE AMERICAN CRANE CO., Inc.

FRIENDSHIP, N. Y.

NEW YORK OFFICE, 30 CHURCH ST.

Maris Brothers Electric Cranes

Crane shown is one of many that have been giving satisfaction for the past 15 or 20 years. This crane is installed at a steel foundry where it must be on the job every day operating in dust, dirt, heat and fumes and where it has been giving excellent service despite the hard usage.

Electric Cranes
Hand Mono-Rail
Electric Mono-Rail

Equipment for Every Hoisting Requirement

Let us send you our catalog; it will help you to select the best type for your purpose.

MARIS BROTHERS, Inc.

5538 Grays Ave., Philadelphia, Pa.

For Spans Up to 50 feet...

for Low head-room Operation-"LHR!"

BOX CRANES

Box makes the famous standardized Type "C" Electric Traveling Crane, and "BR" hand operated cranes. And there is the Box Load Lifter Electric Hoist for loads of 500 lbs. to 5 tons. Write us concerning Cranes and Hoists.

"LHR" is a low head-room, light-capacity, heavy-duty Electric Traveling Crane which takes up less overhead space and gives greater "hook approach" in all directions than any other standard crane. . . .

That is only one reason why "LHR" is chosen by leaders in Industry—

"LHR" is standardized for 1, 2, and 3-ton loads, spans up to 50 feet. Of all steel construction, arc-welded throughout for strength, LHR is Hyatt equipped, requiring but little attention and upkeep. Because of its design, LHR makes an efficient crane service possible in plants where this had not been considered practicable before. . . . Investigate. Send for our latest Bulletin on the LHR.

Electric Traveling Cranes

Grab Bucket Operating Cranes

Hand-Operated Traveling Cranes

BOX CRANE & HOIST CORPORATION

E. Ontario and Janney Streets

PHILADELPHIA, PA.

Established 1878

"One of the Pioneer Crane Builders"

Electric Hoists

Monorail Hoists

Jib Cranes

Special Cranes For Special Conditions

We sell only one EUCLID

to a customer—*After that,* THEY SELL THEMSELVES!

EUCLID
CRANES HOISTS
"Raise Profits"

One of the large railroads has 51 Euclids in four shops—a large iron works has 20 in one plant—a large New York concern has standardized on them and has 53 at present in use—a well known foundry now has 10. These installations are the result of EUCLID ability to make good anywhere AND SELL THEMSELVES. And besides making good THEY SAVE MONEY.

Even in the smaller and moderately sized plants EUCLID Cranes and Hoists are paying for themselves in a short time, because they are trouble-proof, always on the job, power charges are very normal, and they often increase the man power from 10 to 15 times. What is your handling problem?

If it is between ¼ and 30 tons we can help you solve it, and save you money.

THE EUCLID CRANE & HOIST CO.
EUCLID, OHIO

CANTON PORTABLE CRANE

With Safety Friction Load Brake

The operator of this crane can pick up a heavy casting and leave the load at any point in midair without danger of the chain drum unwinding or of the crank spinning around.

That means safety—made possible by the new Safety Friction Load Brake now placed on every new Canton Crane or attached easily to old ones.

CANTON FOUNDRY & MACHINE CO.
Canton Ohio
New York Office: 101 W. 31st St. Greeley Square Bldg.

CLEVELAND TRAMRAIL SYSTEMS

Move it While You Make It

Cleveland Electric Tramrail
Division of
The Cleveland Crane & Engineering Co.
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BEDFORD CRANES

Made in all capacities—Overhead or Gantry—to suit individual requirements. Floor, cage or remote control.
Bedford Steel Stiffleg or Guy Derricks.

Bedford Foundry & Machine Co.
BEDFORD, IND.

MILWAUKEE
CRANES and HOISTS

HOISTS MILWAUKEE CRANES — ROLLER BEARING CRANES

Standard and special overhead traveling cranes and hoists. Single line Grab Buckets. Write for bulletins.
MILWAUKEE ELECTRIC CRANE AND HOIST CORPORATION
Milwaukee Wisconsin
Representatives in principal cities.

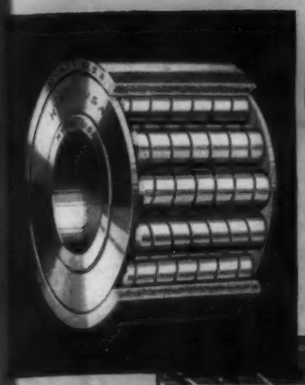
INDUSTRIAL EQUIPMENT
ARMINGTON
FOR HANDLING MATERIAL

THE ARMINGTON ENGINEERING CO.
EUCLID *Write today for Catalog* OHIO

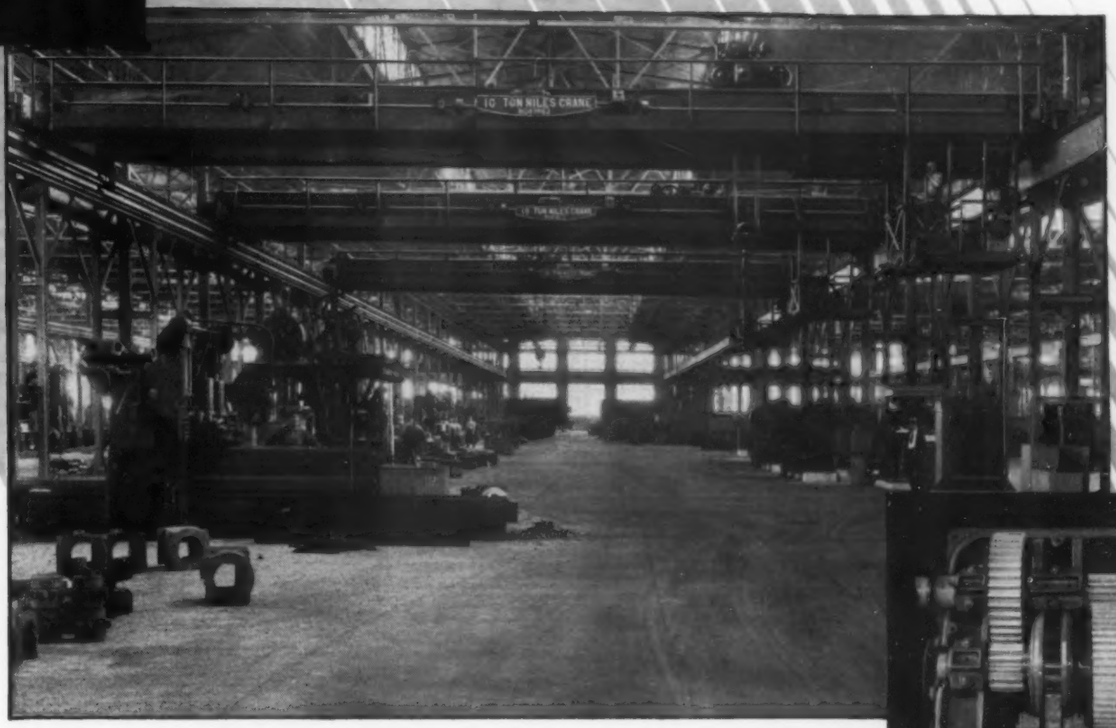
MORGAN
DESIGNERS
MANUFACTURERS
CONTRACTORS

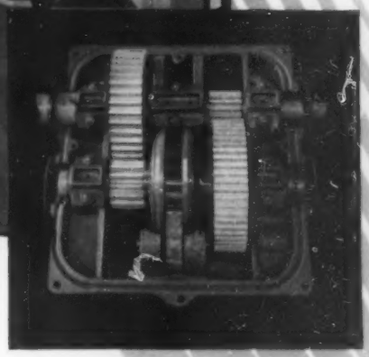
Electric Traveling Cranes, Rolling Mill Machinery, Steam Hammers, Steam Hydraulic Forging Presses, Hydraulic Presses, Rock Crushers, Machine work of all kinds. Special Machinery for any purpose.

THE MORGAN ENGINEERING CO., ALLIANCE, OHIO



COMPACT STRENGTH on Roller Bearings





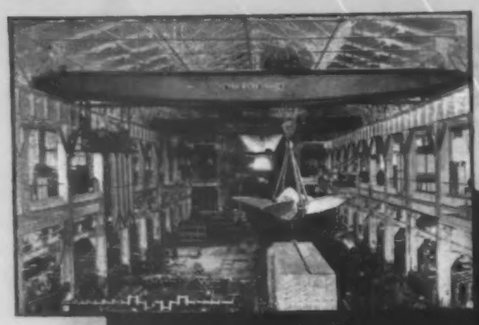
assures enduring, economical handling

High speed reduction gears, load-brake and bearings are compacted into a solid housing in the Niles Crane Trolley. Alignment is lasting — support rigid. And lubrication for all moving parts is positive and continuous from an oil bath within the housing.

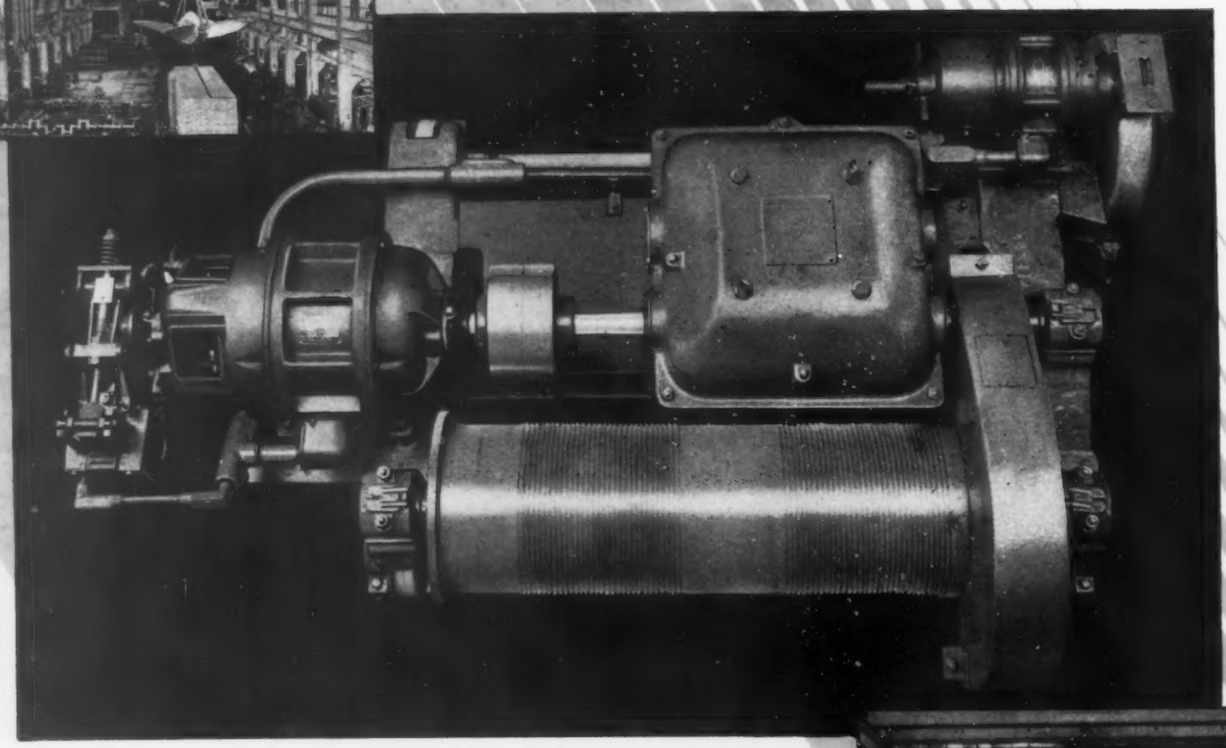
Added protection, to insure low cost load handling is provided by roller bearings at every rotating support. Friction is practically banished. Wear is minimized and alignment made permanent.

When you need an electric traveling crane—from 5 to 450 tons capacity—choose a Niles. It's doubly fortified to assure lasting efficiency.

NILES CRANE
DIVISION



Niles Wall Cranes provide a profitable auxiliary to Traveling Cranes.



LOOK TO THE TROLLEY

compact reduction-gear design . . . for NILES performance

Unvarying performance, that's a feature of all Niles Cranes, in gantry wall and traveling cranes alike. The unyielding rigidity of the compact reduction-gear and load-brake trolley provides new crane precision day after day—and with a negligible amount of attention.

When a Niles crane is serving your plant, loads move on schedule, always,—24 hours a day, seven days a week if conditions demand it. Rugged strength is built into every detail, and all moving parts are fully enclosed for complete protection.

Have a Shepard Niles representative give you complete data. They are located in the principal cities from coast to coast, and are at your service.

SHEPARD NILES CRANE AND HOIST CORPORATION
356 Schuyler Avenue - - - Montour Falls, N. Y.
Works: Montour Falls, N. Y. - - - - Philadelphia, Pa.

Fortified by the compact reduction-gear and load brake trolley, Niles Cranes provide continuous service with a minimum of maintenance.

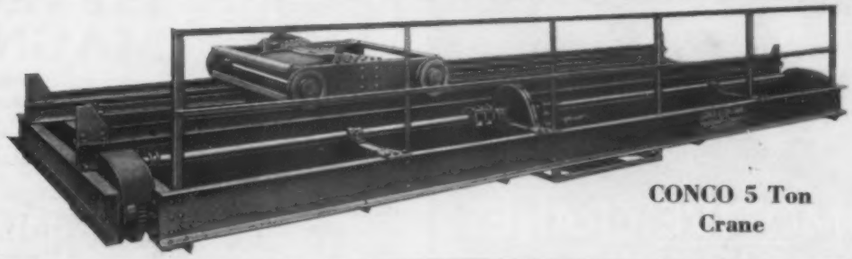
Niles Gantry Cranes are serving some of America's largest railroads.

NILES CRANE DIVISION

Conco Cranes

ENGINEERED FOR LOW HEAD ROOM

WRITE FOR CATALOGUE No. 120



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Built by

CONCO CRANE & ENGINEERING WORKS

Main Office and Works MENDOTA, ILL.

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Up to 200 tons capacity

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58		100 tons
2	WORM DRIVEN Ladle..	100 tons
2		115 tons
5	WORM DRIVEN Ladle..	125 tons
44		125 tons
27		150 tons
2	WORM DRIVEN Ladle..	150 tons
3	WORM DRIVEN Ladle..	160 tons
2	WORM DRIVEN Ladle..	165 tons
3	WORM DRIVEN Ladle..	175 tons
27		175 tons
3	WORM DRIVEN Ladle..	200 tons
2		200 tons
1		225 tons
1		250 tons
3	WORM DRIVEN Ladle..	250 tons
1		250 tons
1		275 tons
3		430 tons

STRIPPING CRANES

8		100 tons
1		125 tons
21		150 tons
17		200 tons
1	Single Ram,	320 tons

COMBINATION CHARGERS AND STRIPPERS

3		100 tons
1		125 tons
3		150 tons
4		200 tons

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ALLIANCE, OHIO, U.S.A.

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STEAM GAS OR ELECTRIC

15 TO 60 TON CAPACITY

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BUCYRUS, OHIO

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Backed by 60 years' experience—clinched by all-steel design, the Peerless Hand Chain Hoist gives longest service with maximum assurance of Safety and Strength.

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All insulation is asbestos. They have maximum lifting capacity. Outer pole has no through holes; it does not loosen, wears slowly and seldom breaks.

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Overhead Material Handling Systems
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HANNA AIR HOISTS

Price is a small fraction of any other type of Power Hoist

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Equipped with hook, bucket, clamshell or magnet, they can easily handle any kind of loose materials. Easily maneuvered on their Corduroy traction—no tracks required.

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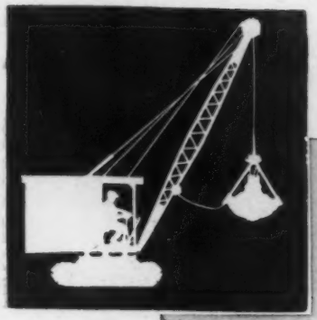
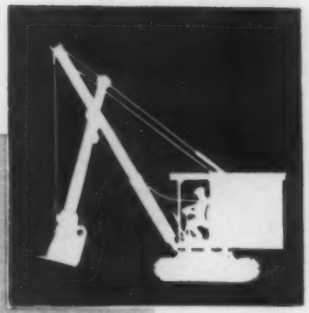
CAPACITIES ¼ to 10 TONS

DETROIT HOIST & MACHINE CO.





A Browning Truck Crane erecting steelwork on the new post office building in Orange, N. J.

A Browning Truck Crane will lop hours off your handling time—both getting to the job and getting the job done. It is as mobile as a truck and does the work of a dozen men. You will get more productive work done with a Browning—the facts prove it. Let us tell you all about them.

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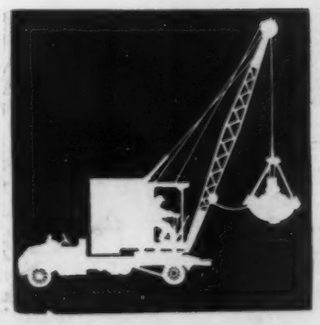
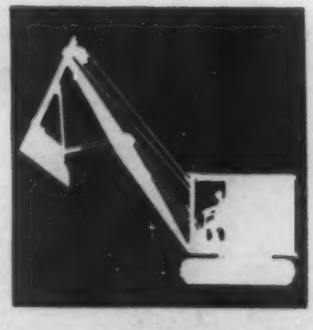
LOCOMOTIVE, TRUCK, and CRAWLER CRANES





62 LO-HED Hoists at work in this modern plant

The adaptability of the LO-HED Hoist to meet almost any requirement where loads have to be lifted or transported is illustrated in the installation shown above. In the new plant of the Mergenthaler Linotype Company, Brooklyn, N.Y., 62 LO-HED Hoists raise and lower sections of monorail track bearing loaded trolleys.

LO-HED Hoists are made in capacities up to 12 tons . . . their compact design utilizes every inch of headroom and enables them to operate where ceilings are low or where bulky loads must be moved over floors crowded with obstructions.

Mechanically the LO-HED is as good as it is good-looking . . . direct spur gear drive, oil bath lubrication, ball bearing motors, short shafts of high-carbon steel, automatic lowering brake, quick-acting holding brake, plow steel cable . . . these are only a few of the features that make the LO-HED a thoroughbred among hoists.

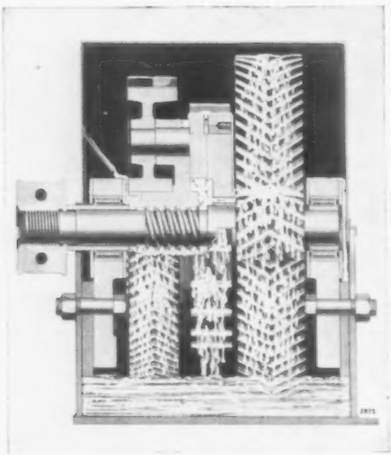
And back of the LO-HED is an organization with many years of experience in solving all kinds of material-handling problems. If you have an unusual job the knowledge of our engineers is freely at your disposal.

AMERICAN ENGINEERING

AMERICAN ENGINEERING COMPANY, 2410 ARAMINGO AVENUE, PHILADELPHIA

One Gallon of Oil in 11 Months—

—and no noticeable wear on this Tiger Crane



Oil-Cooled Mechanical Brake

Oil on the teeth of herringbone gears is squeezed outward as the teeth mesh. In designing the *Tiger* this action was used as a pump to force oil between the brake plates. The constant flow of oil under pressure not only serves to perfectly lubricate the brake, but also prevents over-heating.

Only in the Tiger Will You Find all of These New Features

Herringbone gears
Hyatt roller bearings
Oil-cooled mechanical brake
Oil-bath lubrication of gears
Alemite bearing lubrication
Welded, oil-tight gear cases
One-piece Gatke brake shoes
One-piece steel trolley frame
One-piece steel truck ends
All-steel diamond tread footwalk, full length of bridge
"Safety-first" all enclosed switchboard
No overhung gears
One-piece steel casting for all bearings in each gear train
Thomas flexible couplings
All parts quickly accessible
Standard parts carried in stock
Flexible design adaptable to all conditions

This TIGER crane used only one gallon of oil in 11 months of continuous service....handling 7-ton loads of steel bars in the yard of a large forging plant near Chicago.

Again the superior performance and stamina of the TIGER was proved. The herringbone gears looked like new. Races of the Hyatt roller bearings were all tight. Bearing washers showed no sign of wear.

Whiting cranes have given satisfaction in this plant for 14 years. The operators say the TIGER is even better than the other 8.

Our new bulletin "The Tale of the Tiger," tells the story of the new features that make "unusual" performance typical of the TIGER. It contains a partial list of users, complete clearance tables, and other valuable data about the TIGER crane.

Send for this Valuable Book Today

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"Automatic" Material Handling Equipment is more than "just trucks." They are built in dozens of models, sizes, capacities and types for solving intra-plant and material handling problems... crane trucks for lifting... tiering trucks for stacking and loading... die handling trucks for placing heavy machinery ... tractors for hauling trackless trains ... baggage trucks for stations ... elevating platform trucks for handling skids...load carrying trucks for general utility and many other specialized models.

"Automatic" maintains a nationwide organization of material handling specialists to help you work out new ways to save in 1930. Write for the name of the "Automatic" man serving your territory. It is his business to sell by saving.

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Even at double the price "Automatics" would still be a Good Buy

Affiliated with BARRETT-CRAVENS CO., Chicago, Manufacturers of Hand-Lift Trucks, Lift-Truck Platforms, Portable Elevators, Structural Steel Storage Racks and Barrel Trucks; also WALKER VEHICLE CO., Chicago, Manufacturers of Electric Street Trucks and Tractors.

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A new model, durable and spacious factory truck for the economical handling of materials. Size 34" x 98" x 30" high. Capacity 8,000 pounds. Extra strong reinforced frame. Wheels are equipped with Hyatt roller bearings and have large diameter and bearing tread. The patented coupling permits instant coupling and uncoupling from the driver's seat. Truck can be swung around on its own center. Saves many times its low cost.

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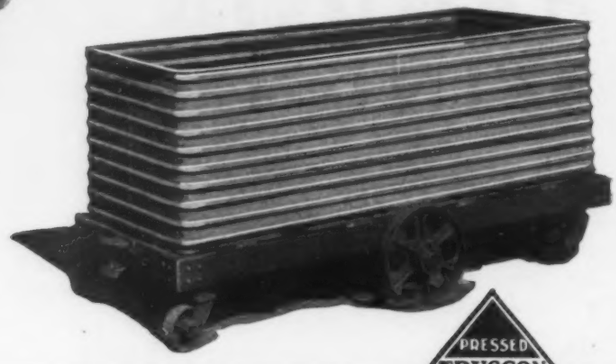

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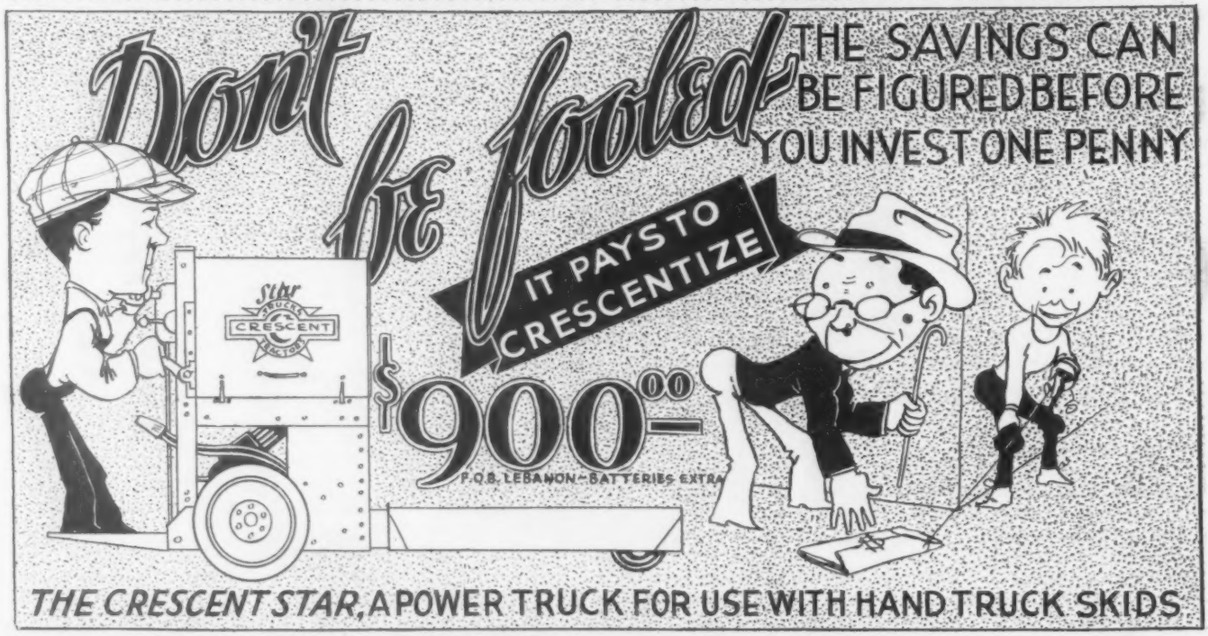

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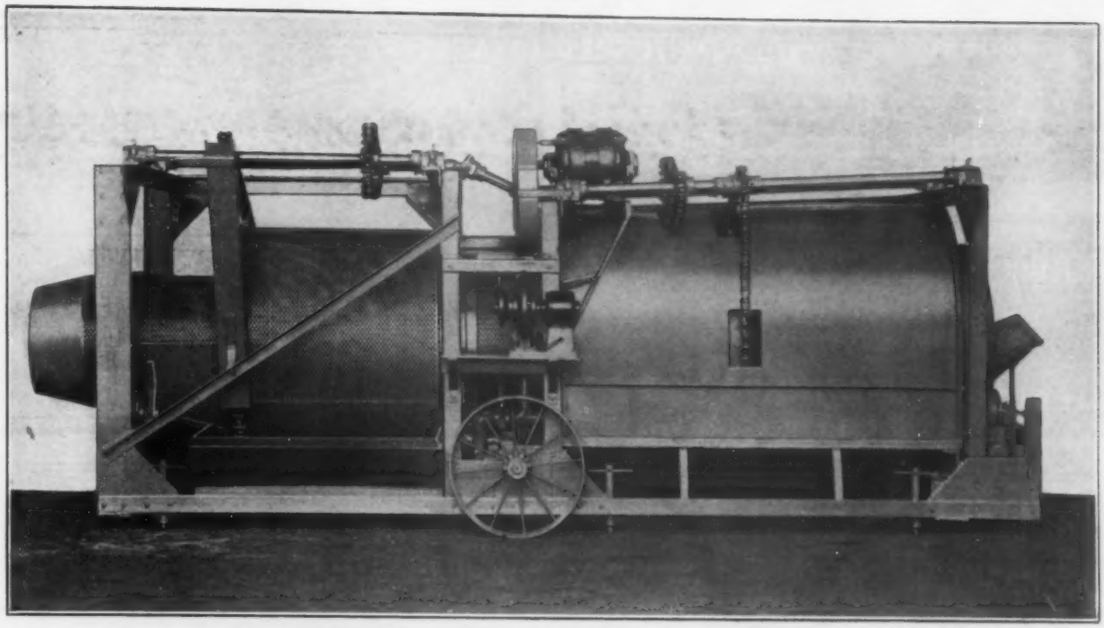

The IDEAL Zinc Slinger that improves the finish on galvanized parts

A better galvanized finish with the IDEAL Zinc Slinger

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Engineering Service

Problems of removing scale, chips and fins from castings and forgings—of scrubbing, rinsing and drying stamped and drawn parts, removing grease, oil and chemicals—are special problems. Our Engineering Service involves a study of your particular problem and the application of automatic equipment to solve it *at a considerable saving in labor.* Our engineers will gladly examine your situation—asking them to do so will incur no obligation.

A good galvanizing job depends as much on what happens to the parts after they are coated as on what is done to them before they are coated.

In the plant of Hubbard & Company, Pittsburgh, high standards of quality govern every operation in the production of pole line hardware. The company is especially careful of its galvanizing operation, paying particular attention to the smoothness of the finish and the elimination of excess zinc on the threaded work.

An IDEAL Zinc Slinger receives the work from the galvanizing pots.

The first section is a slanting hooded barrel, gas heated. The barrel is of perforated metal, its angle is adjustable, it revolves at 50 r.p.m. As the work dances through, excess zinc is removed and is reclaimed in a chute beneath the hood. Parts travel into a larger drum, revolving slowly in water. This process quenches, but does not cool—the zinc is set, the finished parts are discharged and dry of their own heat.

Results: Better finish, increased production, lower labor costs. In fact, C. E. Miller, Production Manager, writes:

"After twenty solid years of experience with galvanizing equipment, I will say the IDEAL machine is the best I have ever seen for this kind of work.

"It is a real go-getter from both a quality and a quantity standpoint. It does a good job on all threaded work from 5/16" x 1" to 1" x 24". We run through this machine hardware of different shapes, with and without threads, weighing up to 15 lbs. per piece. Incidentally the preliminary tumbling to remove scale before machining is accomplished in IDEAL Tumbling Barrels."

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N. Ransohoff Incorporated

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60 Ton Diesel

The PLYMOUTH
LINE OF GASOLINE AND DIESEL
LOCOMOTIVES
Is complete from two to sixty ton sizes. Write for catalog and performance bulletins. Time is the test. It's the saving in operation cost that counts.
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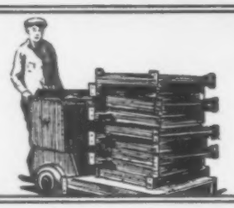
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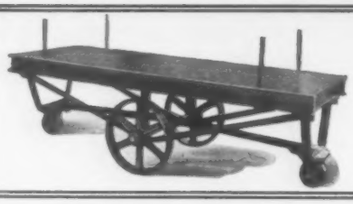
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REYNOLDS for *easy* handling of Heavy Loads

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There are reasons, of course. Reynolds Trucks are designed and built for *all* purposes. The unique arrangement of the wheels and casters permits them to turn in their own length, and for use on and off elevators, scales, etc. Here is a decided advantage where crowded conditions prevail.

Another superior feature of Reynolds is that the casters are mounted on caster bolsters —*not on the frame proper.* The heavy side rails, end rails, and center frame work are all of the best northern hardwood—strongly bolted together, giving unusual stability and sturdiness. Large wheels carry load weight, maintaining perfect balance. Reynolds Trucks can be easily handled by one man when loaded to capacity.

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Offers the most economical method known of finishing small metal stampings, castings, and forgings.

The weight of thousands of small steel balls passing over the surface of the work rolls down the minute irregularities, and brings up a beautiful lustre on steel, brass, and practically all other metals.

Ball Burnishing can be used successfully both before and after plating operations.

Why not investigate this economical finishing process? Send samples of your work for an experimental burnish.

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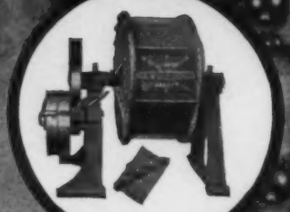

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The Branford Flask Rapper is cutting flask cleaning time enormously in many foundries.

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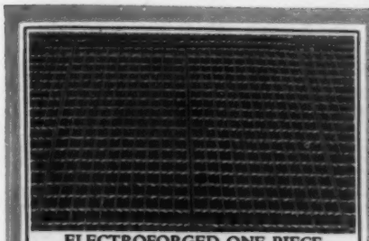

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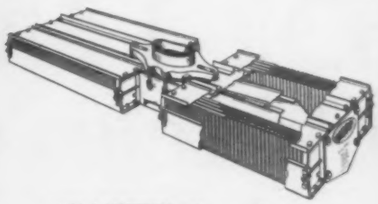

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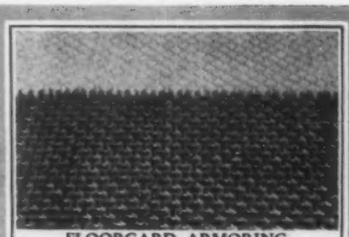

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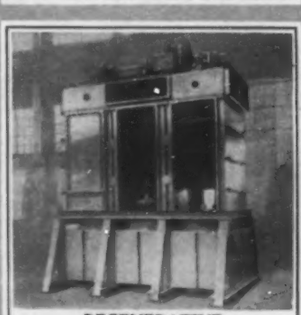

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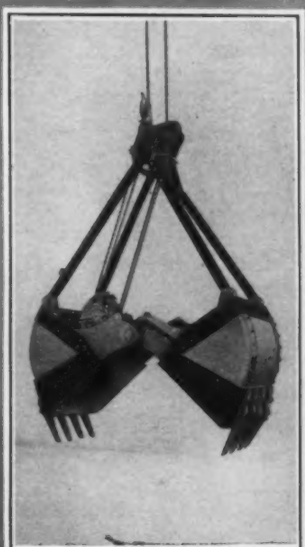

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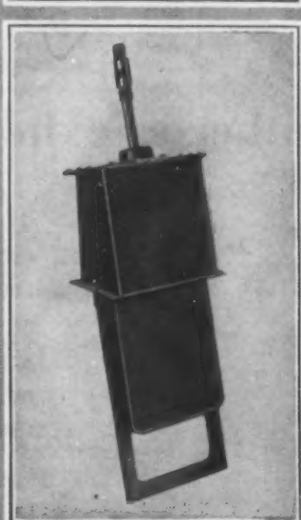

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EXHIBITION
of the American Foundry

In Conjunction with the Thirty-Fourth Annual Convention
Public Auditorium CLEVELAND, OHIO
May 12, 13, 14, 15, and 16, 1930

If you manufacture, buy, sell, or use any equipment, supplies, machinery, or service to foundries, machine, pattern, or allied shops—

BE THERE!

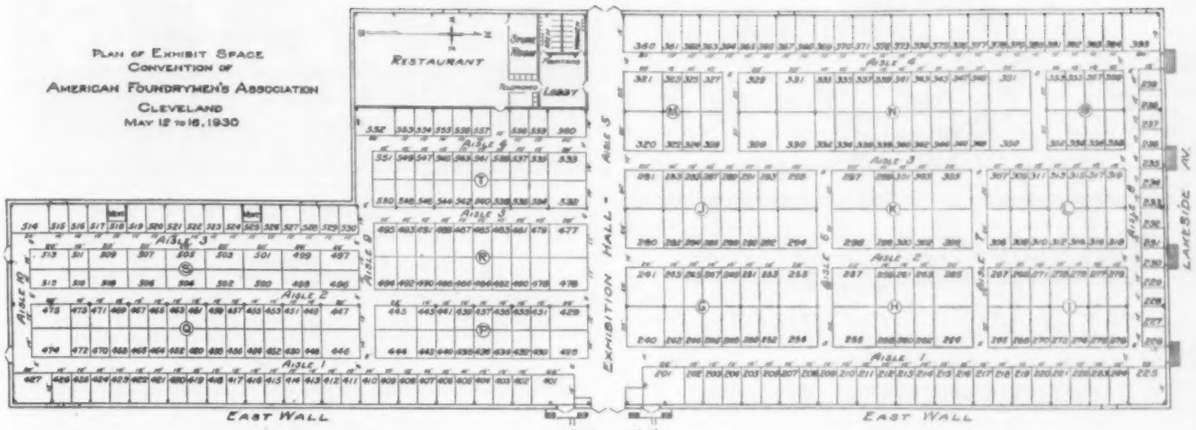
either as exhibitor, spectator—or both

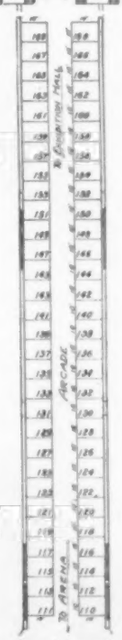
This Convention and Exhibition, national in character, is attended by officials and shop executives from all industrial sections of the United States and Canada—all vitally interested in improving manufacturing practices and the selection of equipment that will save time, increase production and reduce costs—men vested with authority to make decisions and purchase equipment.

For complete program of technical sessions or for information concerning available exhibit space, wire or write immediately to

DEPARTMENT OF EXHIBITS
American Foundrymen's Association
222 West Adams Street Chicago

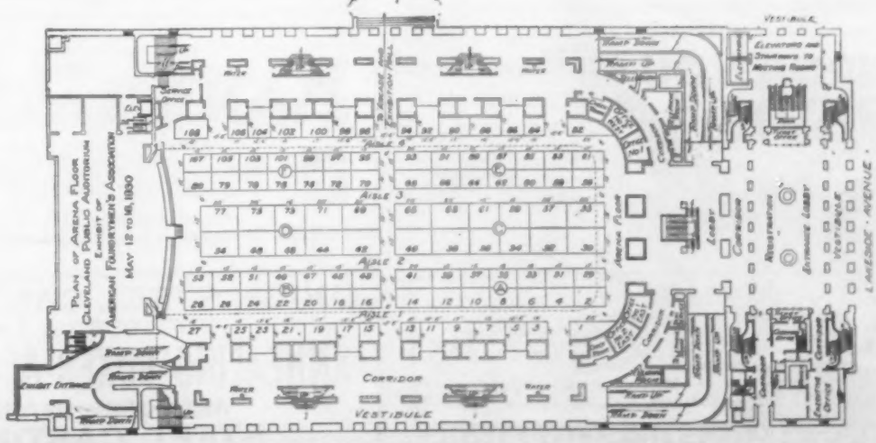
men's Association





FOR five days and two evenings, opportunity will be given to all interested persons to inspect the latest types of equipment, to examine materials and supplies and to discuss with engineers and experts the design and construction of special-purpose equipment for foundry use. Over 250 exhibits, many in operation — more than 90,000 square feet of floor space occupied.

ATTEND the Convention, miss no opportunity to cultivate personal contacts and get other men's ideas. Send representatives with one definite objective—increased knowledge of foundry operations. Capitalize this knowledge by having them submit reports on all they see and hear. Make your convention expenses pay full dividends of improved shop methods and practices.



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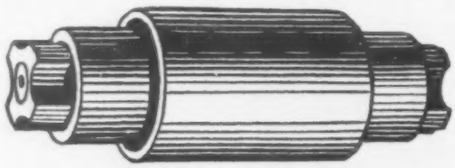

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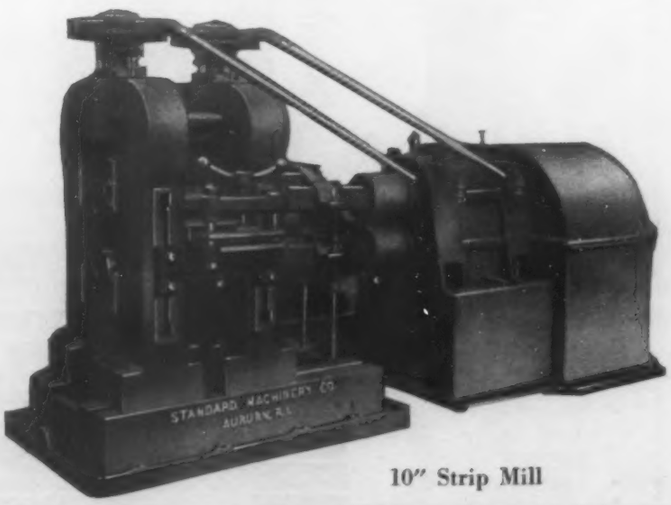

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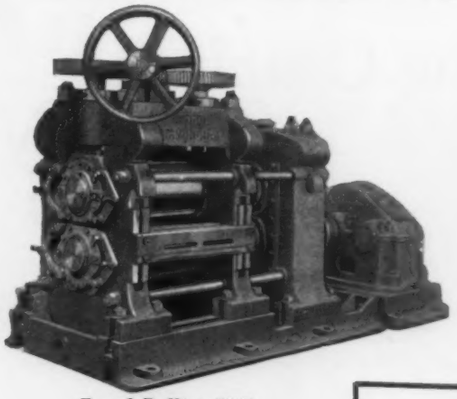
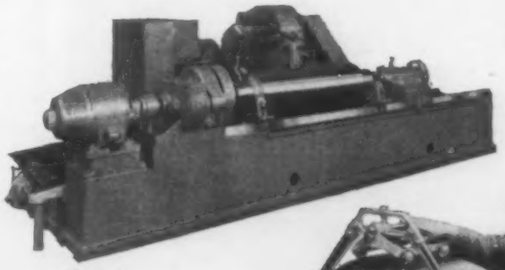
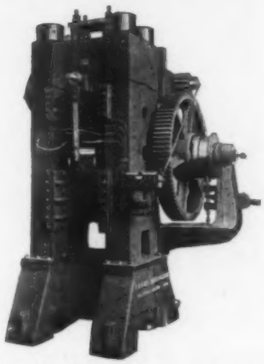


Farrel Rolling Mill

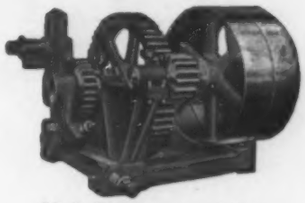


Farrel Heavy Duty Roll Grinder

Farrel Indicating Caliper



L & N Knuckle Joint Press



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Farrel Heavy Duty Roll Grinders are thoroughly modern machine tools with many exclusive features of design that increase the efficiency of grinding, reduce maintenance costs and produce a high quality of work.

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L. & N. Sheet Metal Working Machinery includes Straight Sided, Single and Double Crank, Tie Rod Presses, Press Brakes, Knuckle Joint Presses, Mitre Presses, Power Squaring Shears, etc.—a diversified line of different types and sizes for a variety of applications.

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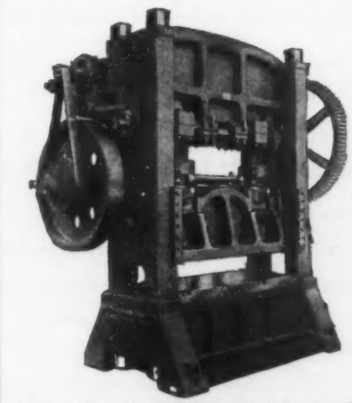
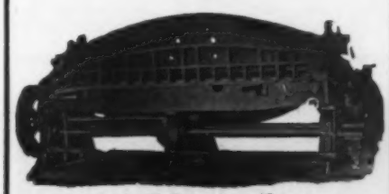
M & P Drop Press



L & N Straight Sided Double Crank Press

M & P Blast Gate



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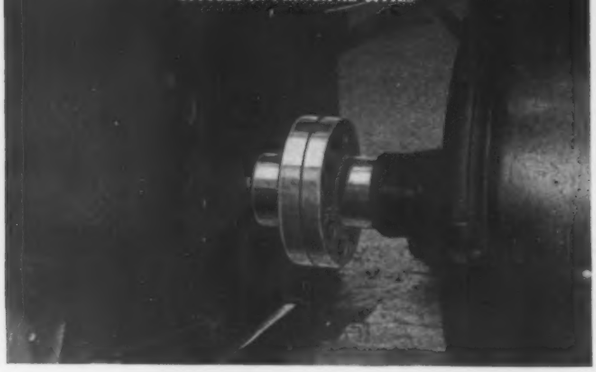

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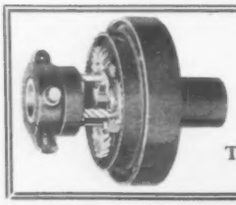

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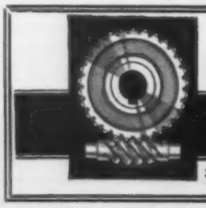

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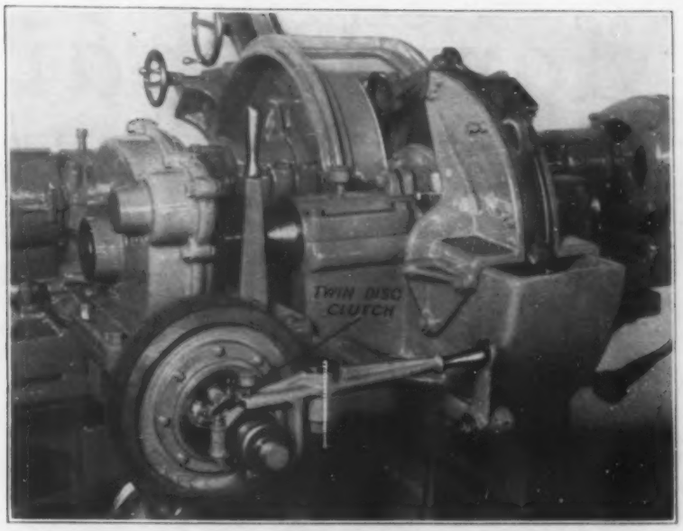

Photo by courtesy of Gardner Machine Co., Beloit, Wis.

IF MASS production means anything, it means continuous performance of automatics and special machine tools. No unnecessary delays can be tolerated.

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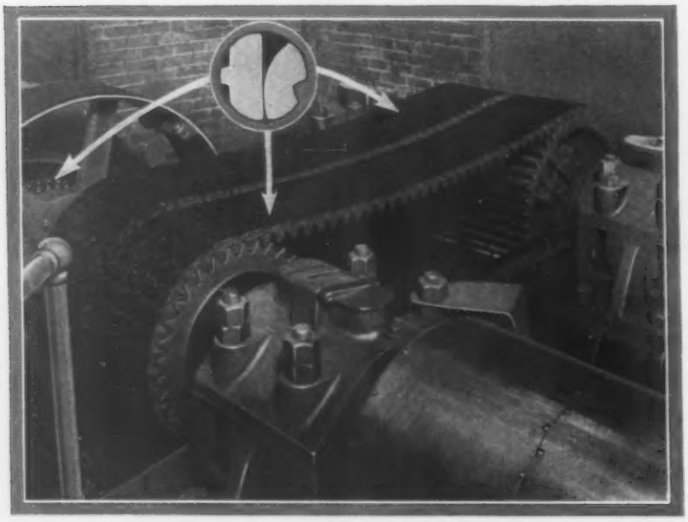

The Morse Silent Chain Drive used by the Buffalo Bolt Co. on a 400 H.P. rolling mill, consisting of two 13 in. Morse Chains operating at a speed varying from 200 to 300 R.P.M., gave 8 years service—sometimes running 24 hours a day—before requiring renewal.

FOR 15 years, the Buffalo Bolt Co. have used Morse Silent Chain Drives between motors and driven units. Their present annual production is 750,000,000 bolts, nuts, screws, etc., and 70,000 tons of rolled steel products.

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The 400 H.P. rolling mill drive consists of two 13 in. Morse Chains traveling at a speed varying from 200 to 300 R.P.M. This drive is subjected to hard service, because there are sudden changes from idling to full load, but the flexible Morse Chains minimize the shock on drive, motor and machine. This Morse Drive gave 8 years' service, sometimes running 24 hours a day, before it required renewal.

The company finds that Morse Chains pay for themselves many times over because they permit no slipping with consequent loss of power; take up sudden shocks; save floor space by operating on short centers; require little upkeep.

The long life of the Morse Chains—10 years, in some cases—minimizes expensive delays for the purpose of adjusting, repairing, or replacing drives.

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The Jones Herringbone-Maag Reducer (shown here with its hat off) is of the double reduction type, carefully designed by the best engineering skill to give long years of trouble-free service. It is inexpensive to install, it requires no attention except an occasional refilling of the oil chamber, the housings are sturdy and dust-proof, and the gears are precision-cut—just as are the other two Jones Reducers —Worm and Spur. All three are rated to stand above-normal loads. Quick service from a large stock of standard ratios is our specialty. Let's get together on your requirements.

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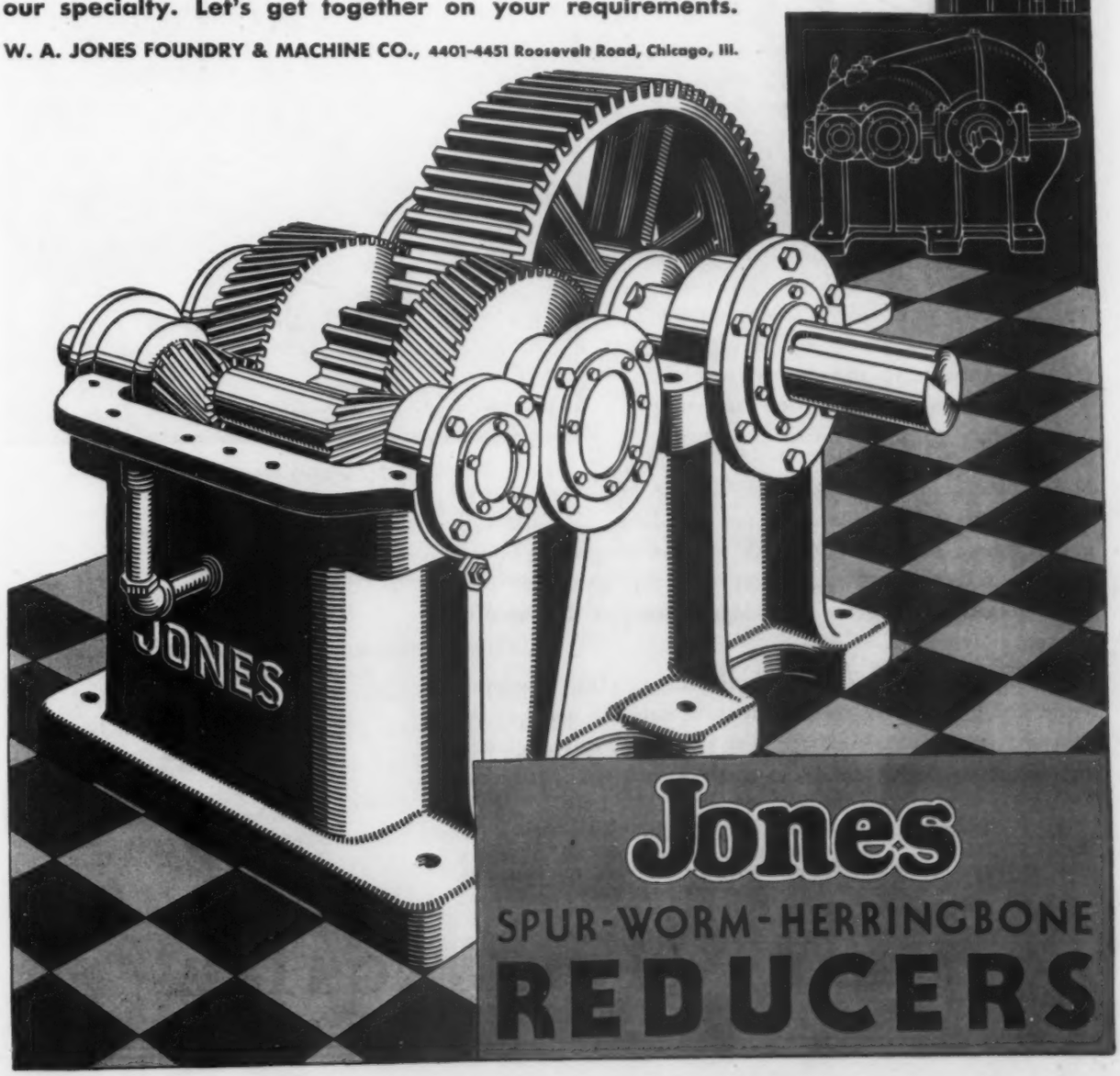
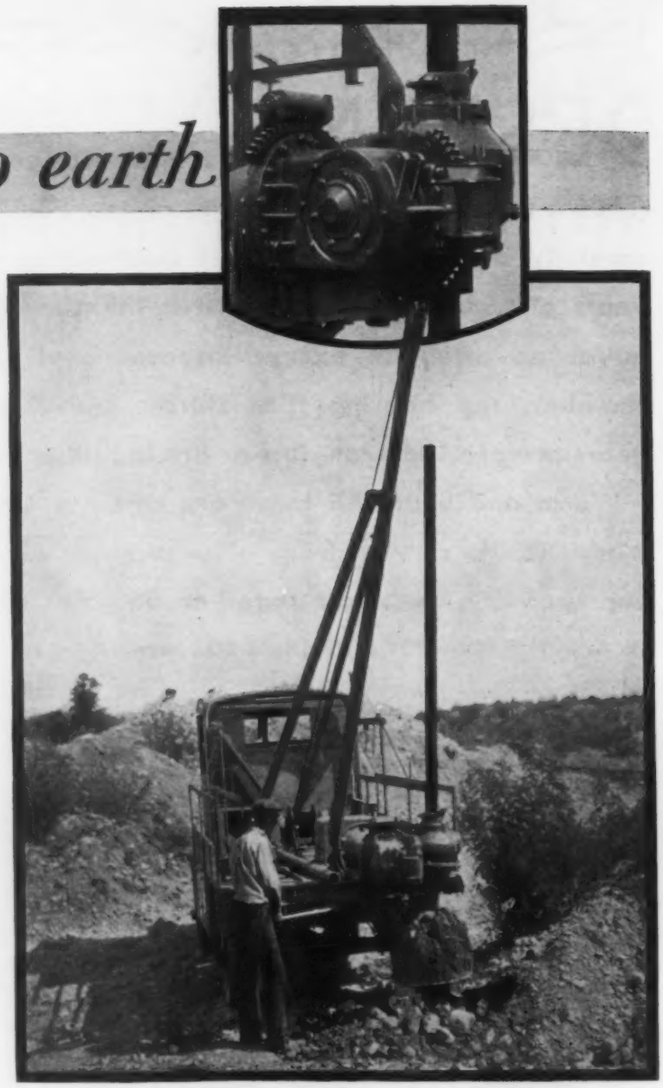


Getting down to earth ...in analyzing GEAR problems



IF you are up in the air about your gear problems—exasperated by frequent failures, perhaps we can help you get down to earth. Usually it's only a question of analyzing your equipment—the stresses and strains it receives in actual service—then designing gears to meet those conditions.

For instance, the Highway Earth Boring Machine pictured here bores post holes seven to ten feet deep .... through gravel, shale or frost. It needs *dependable* gears. G & F gears keep these machines operating at top speed day after day—because these gears are designed for just that kind of service.

Our complete production facilities, including a fully equipped forge plant, enable us to furnish accurately cut gears of the proper type and hardness for any job. And our engineers "get down to earth" when they analyze your gear problems.

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WHERE speeds are high . . . where smooth operation is required . . . where quietness is a factor, there is no drive that fills the bill like the HERRINGBONE.

Horsburgh & Scott Herringbone Gears are Sykes type . . . accurate . . . with a continuous, double helical tooth . . . giving increased bearing surface . . . greater resistance to wear. These gears . . . the last word in Herringbone Gear design . . . provide the most economical . . . the smoothest known means of transmitting power between parallel shafts.

In these gears, as in Horsburgh & Scott Spur Gears, Worm Gears, Bevel Gears, Helical Gears, Non-Metallic Pinions and Speed Reducers, you have all the benefit of our 40 years of gear-cutting and engineering experience . . . Send us your problems.

This loose-leaf catalog describes and illustrates the full line of Horsburgh & Scott Speed Reducers, and contains engineering data that will be valuable to you. Write for it.

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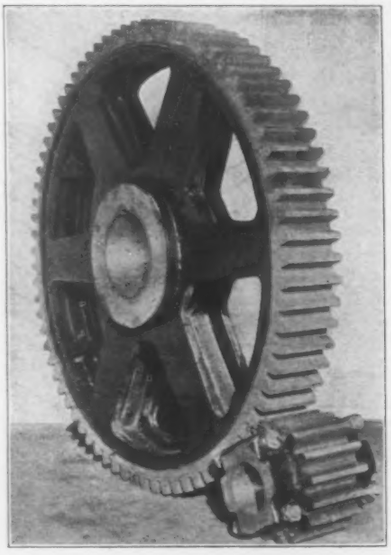

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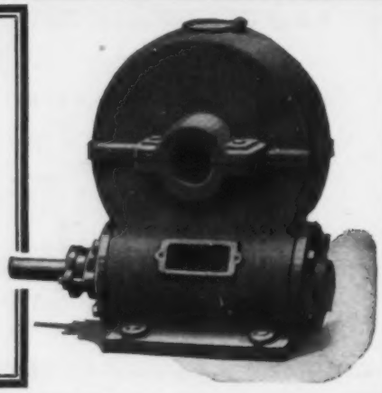

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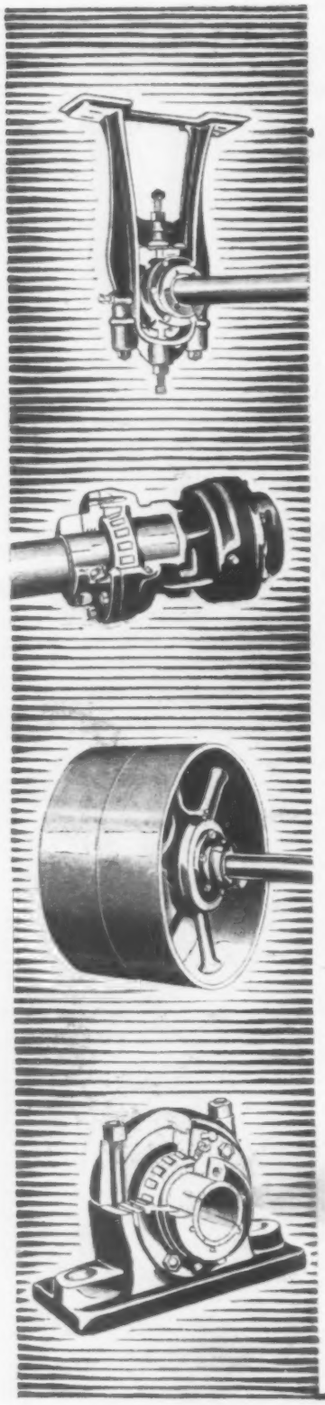

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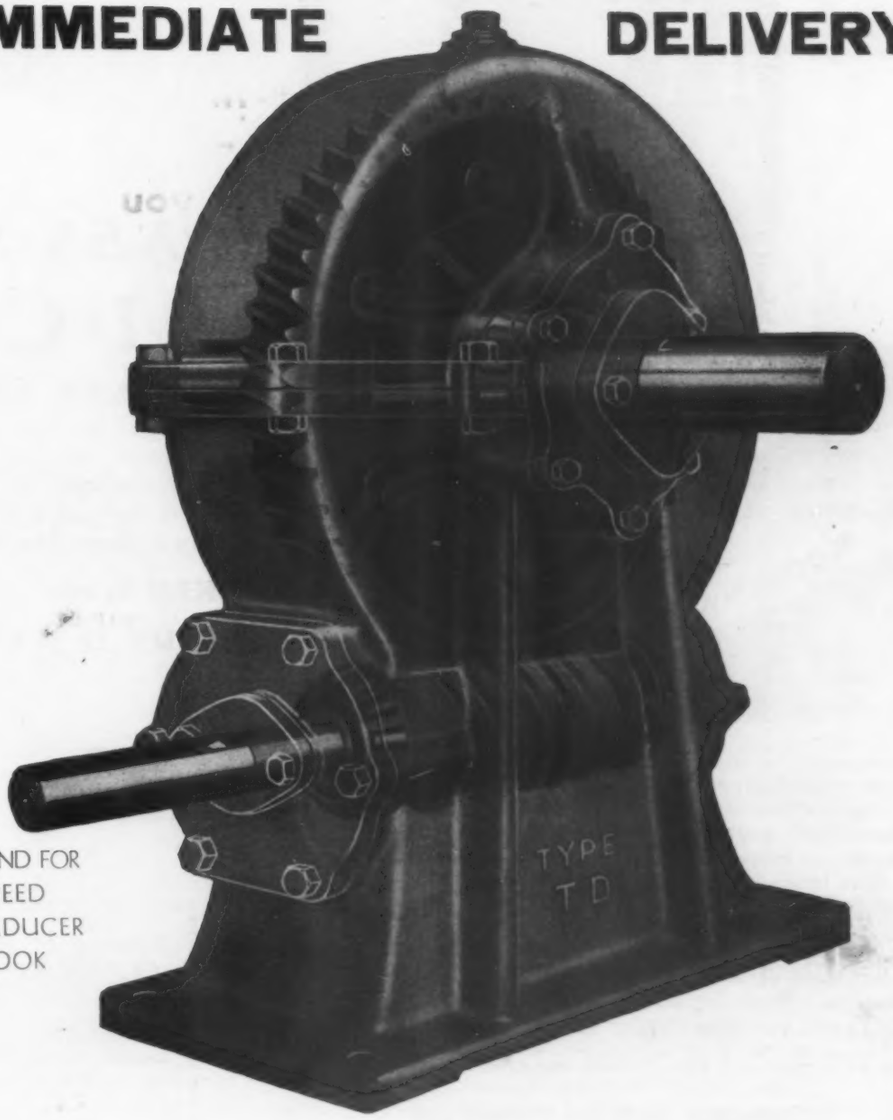

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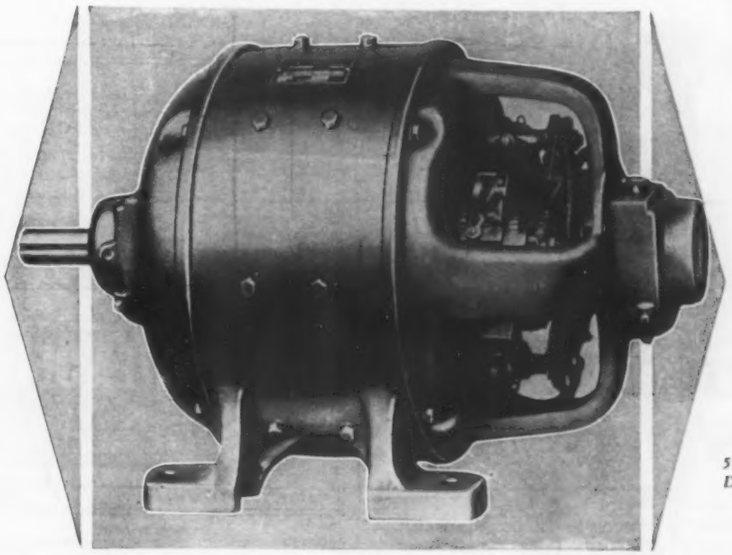
THEY KEEP A-RUNNING



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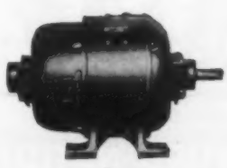

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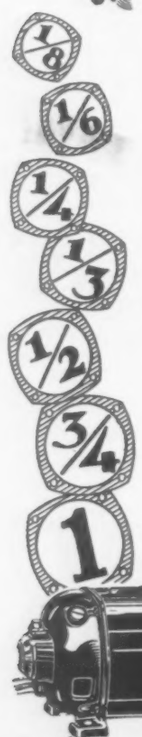

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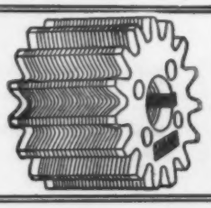

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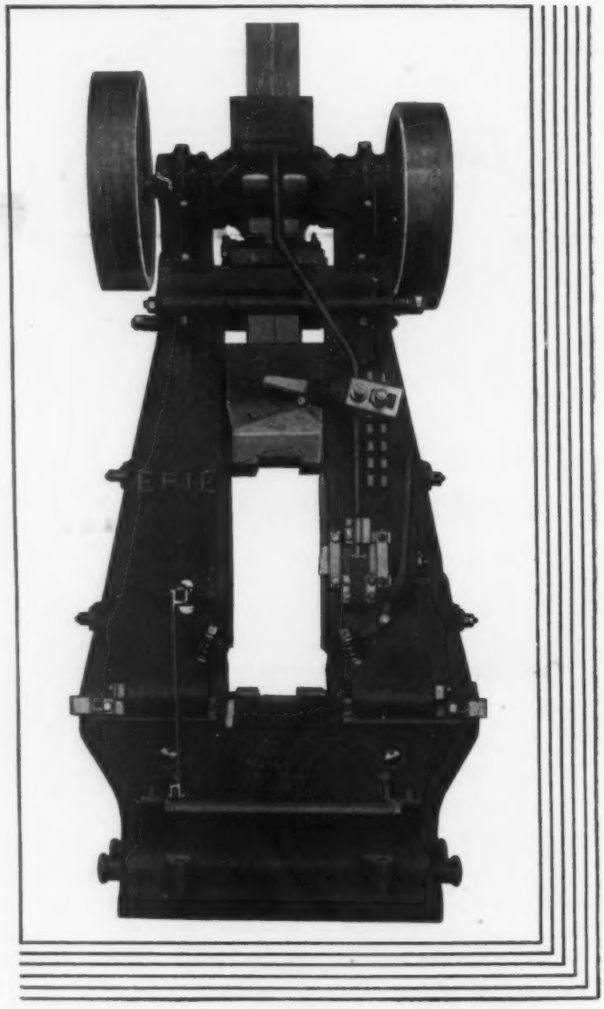
BOARD DROP HAMMERS IN STEAM DROP DESIGNS



TEN years ago, before the Erie Foundry Company added board drop hammers to its line, the best that could be said for the board drop hammer was that it worked cheaply when it worked. That the board drop today is a very respectable tool is due to innovations and improvements pioneered by this company, and reaching their culmination in the new, improved, Erie Board Drop Hammer in steam drop hammer styles.

As a concession to convention, the first Erie Board Drop Hammers were made with the usual I-beam frames. Innovations were made in many details, however, including end wedge adjustment.

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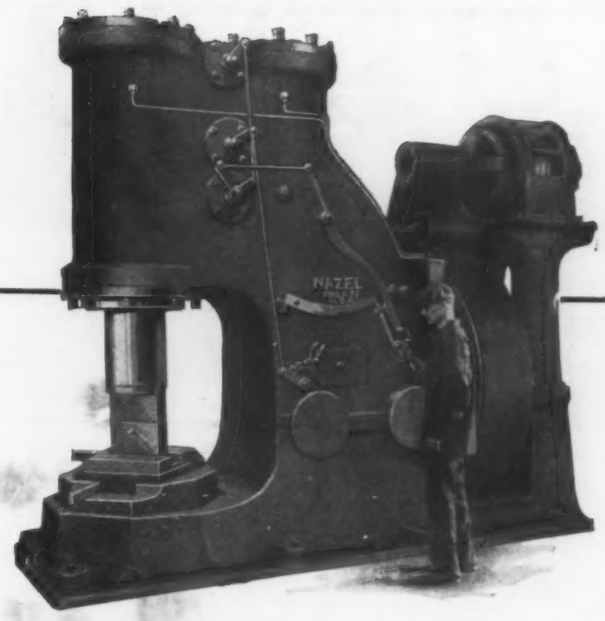

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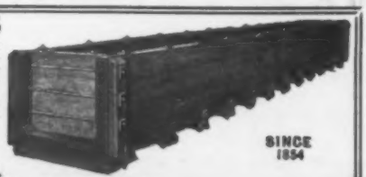

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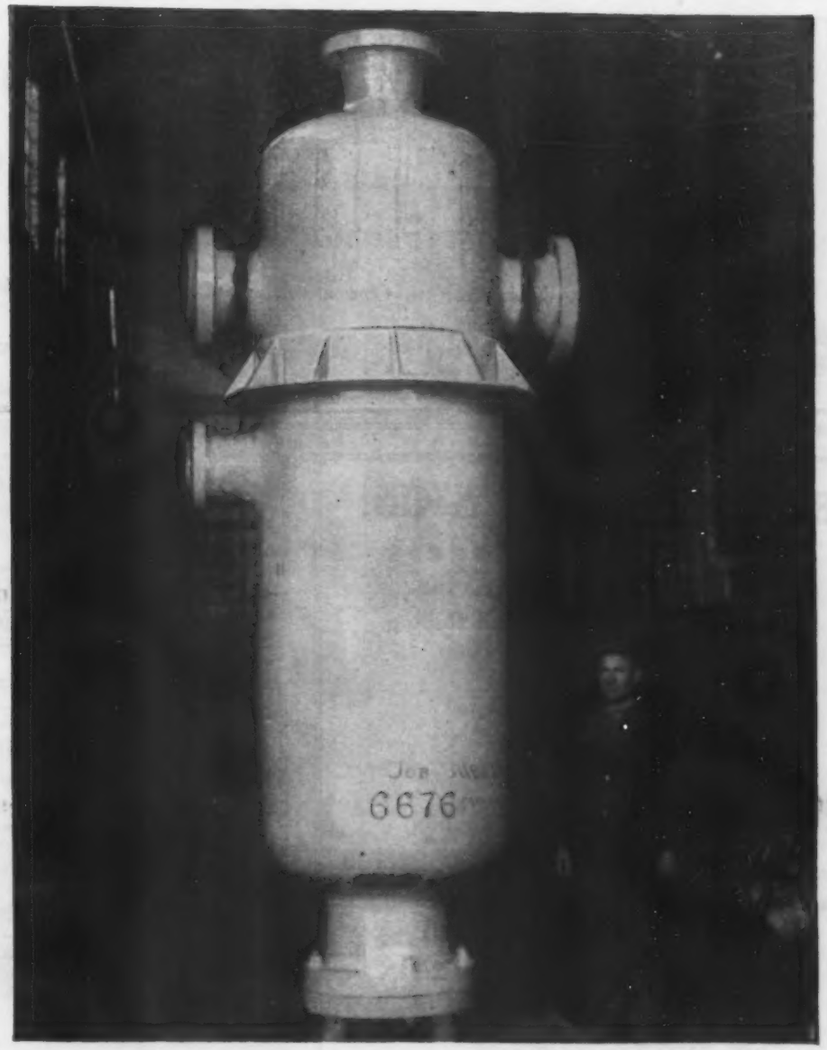

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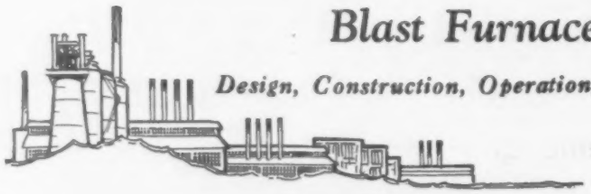

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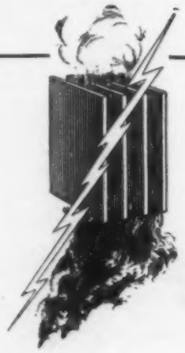

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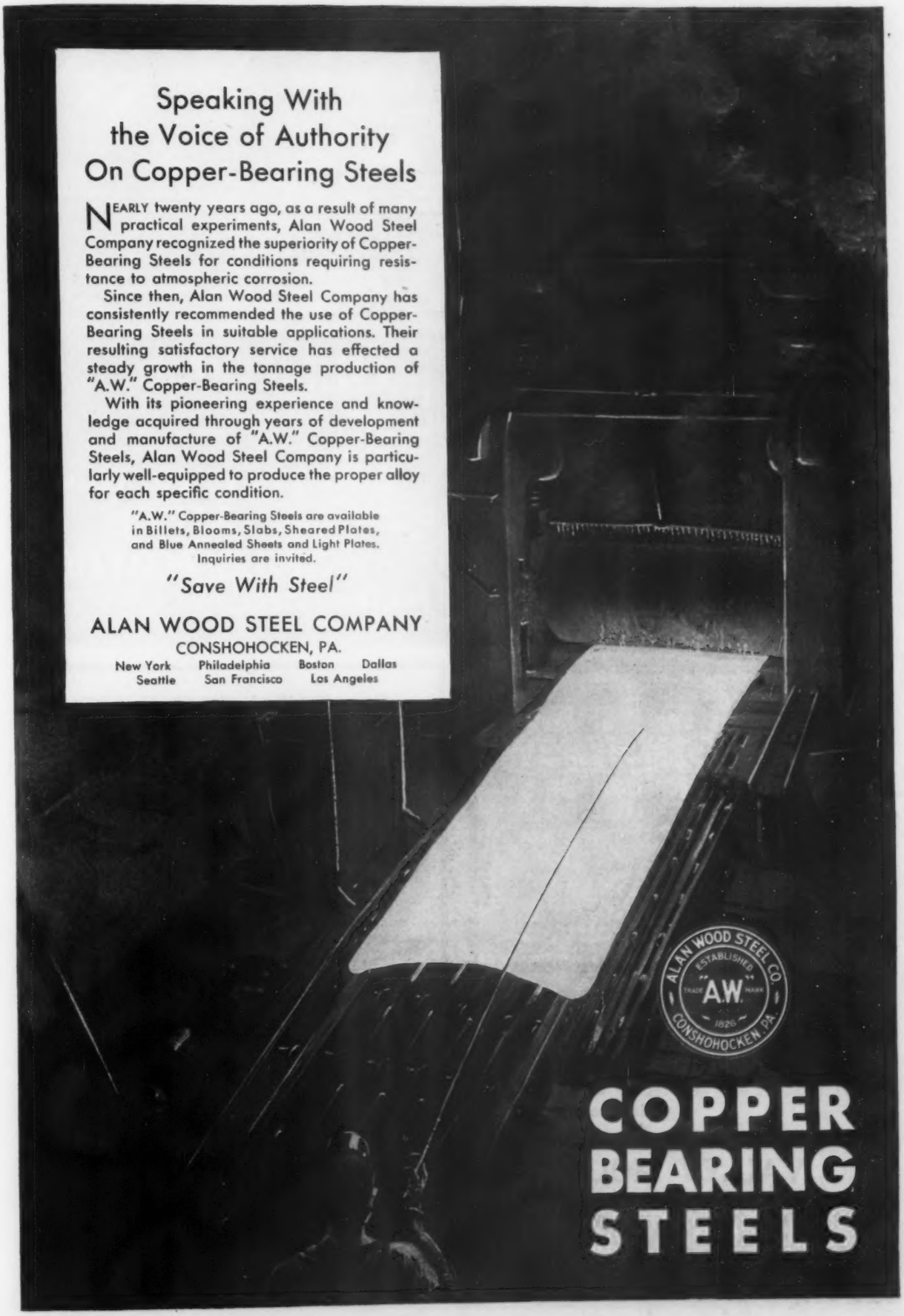

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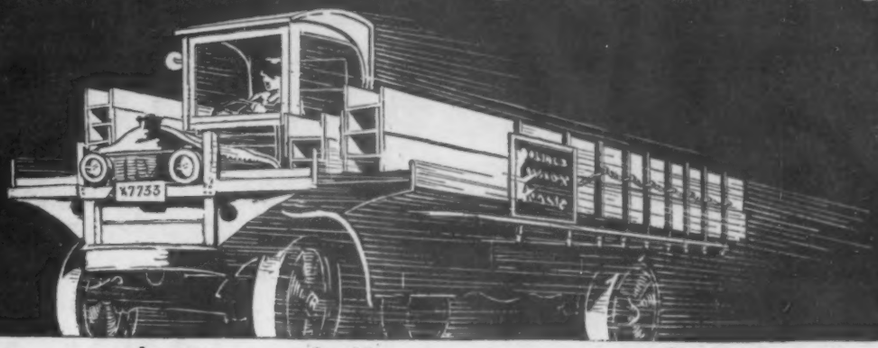

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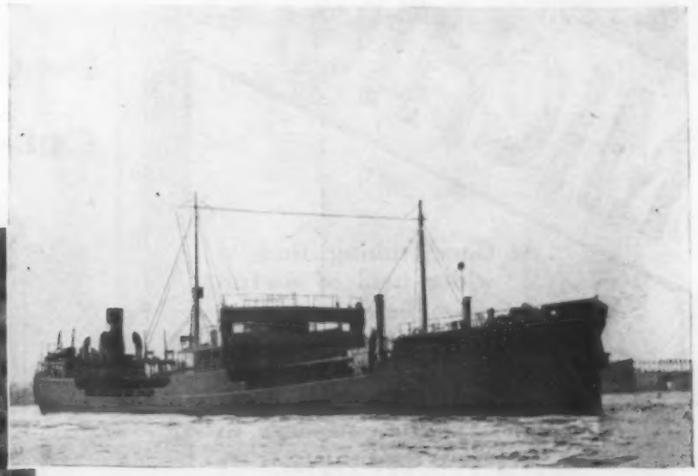

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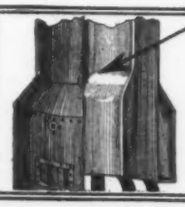

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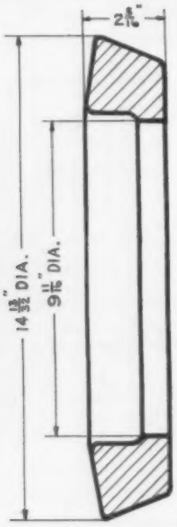

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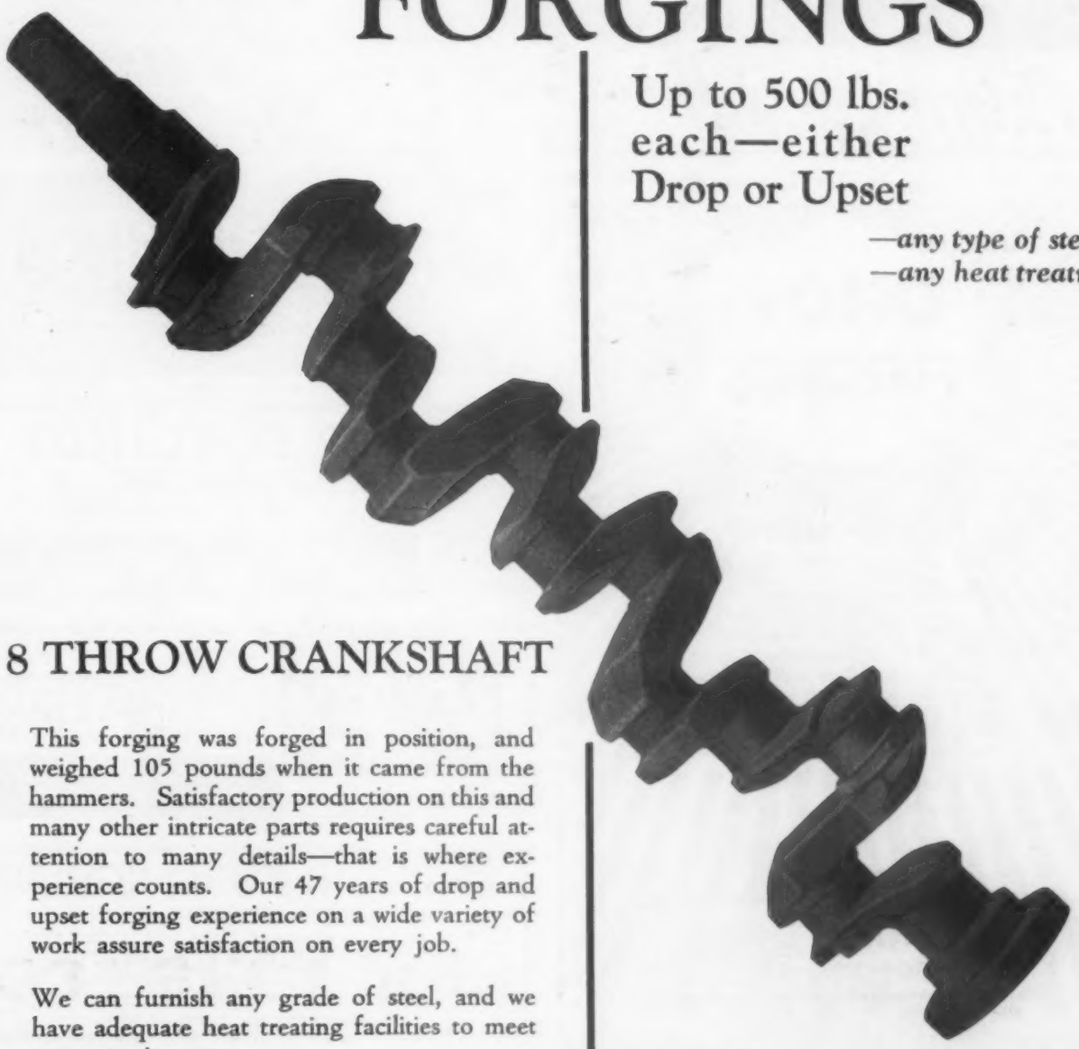

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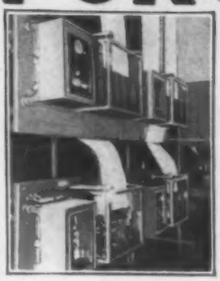

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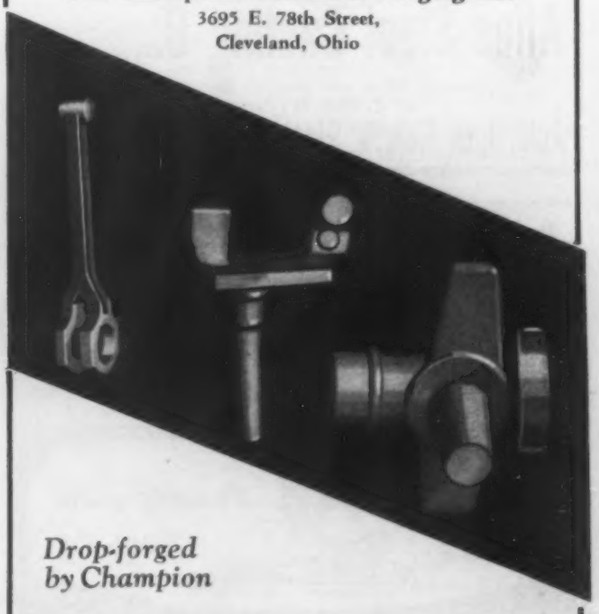

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NATIONAL SAFE DOORS

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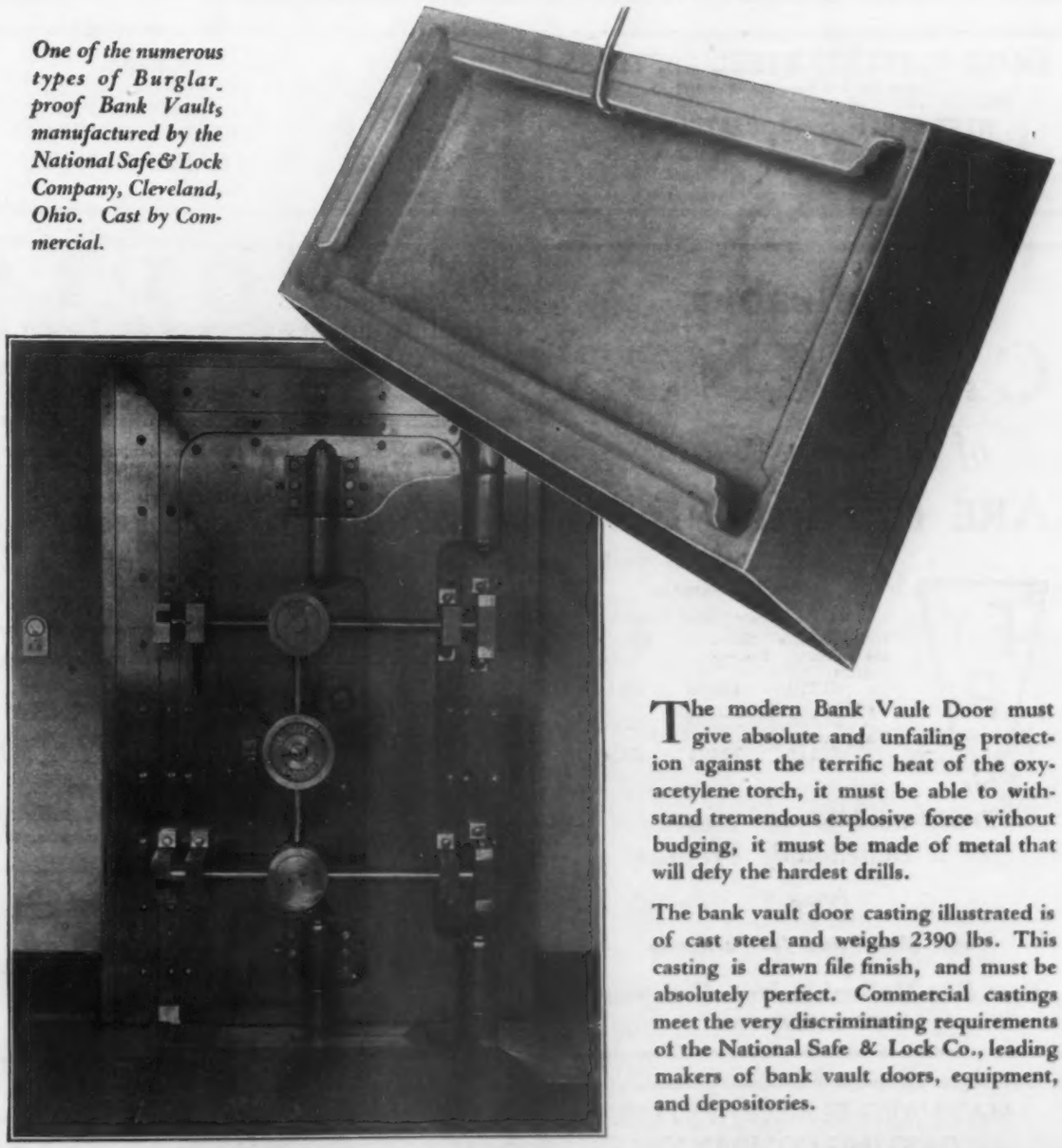

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VERMILION MALLEABLE IRON CO.
Member of
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MEEKER FOUNDRY CO.
Malleable Founders for 85 Years
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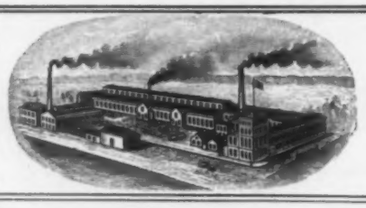
QUALITY NEWARK, N.J. SERVICE

MAYNARD ELECTRIC STEEL CASTING COMPANY
Electric steel castings from 1 to 10,000 lbs. each
1-11 Kilbourn Road Milwaukee, Wis.



I. S. Spencer's Sons INC.
Guilford, Conn.
Manufacturers of Light Grey Iron, Brass and Bronze Castings
Patented Articles
General Hardware
Screw Machine Products
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Light Gray Iron
CASTINGS
Highest reputation for quality and service
Forest City-Walworth Run Foundries Co.
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Three individual foundries at your command

GRAY IRON CASTINGS

From the Smallest up to 30 tons each

We Specialize in
FINE, SMALL HARDWARE CASTINGS
INGOT MOLDS FOR BRASS AND COPPER
MANHOLE FRAMES AND COVERS
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GENERAL MACHINERY CASTINGS

We have 100 tons daily capacity to assure you prompt service; experienced founders to assure you high quality castings; and order routing system that prevents delays; and fireproof storage to safeguard your patterns.

Send blue prints or sketches for an estimate.

THE SESSIONS FOUNDRY CO., Bristol, Conn.

Established 1879

Non-Ferrous Castings of Every Description From 1 Ounce to 5000 Pounds

Pure Copper Castings
Acid Resisting Castings
Manganese Bronze
Aluminum Bronze for Welding Dies
Aluminum Alloy Castings

If, in your product, you use non-ferrous castings, you most certainly want the finest it is possible to get—consistent with reasonable cost.

And if these castings do not exceed 5000 pounds in weight, regardless of whether they are simple or most intricate, we would be pleased to submit quotations and give you such suggestions as you may need and our long experience makes available.

The John Harsch Bronze & Fdry. Co.
11612 Madison Ave. Cleveland, Ohio

A Just Comparison

Even as the piece of bent wood is stronger and lighter than the corresponding piece cut from a wood block, so is the pressed metal piece stronger and lighter than the casting. That is one advantage of pressed metal.

Among the other advantages is, that we can do it for you at a saving. Repeat orders from our oldest patrons prove that we work well and work savingly. Why not send us your blue prints to estimate from? It may be the beginning of a mutually profitable business acquaintance.

WORCESTER STAMPED METAL © · QUALITY · STAMPINGS

Worcester Stamped Metal Company
Successors to W. & S. Mfg. Co.
Established 1883
Worcester, Massachusetts
Philadelphia Representative: H. L. Hess Co., 2106 West Atlantic St.

GRAY IRON CASTINGS

Small and medium size

LESS than one half of one per cent loss on this combination gear and eccentric over period of last eighteen months—note design and machining.

Carefully supervised castings will put dependability into your product and lower costs. Alloys for pressure castings or where strength and wearing qualities are needed.

THE XENIA FOUNDRY & MACHINE CO.
XENIA, OHIO *"Yours for better castings"*

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BRASS
BRONZE · COPPER
AND ALUMINUM

Rough, semi-finished, finished or assembled. Complete engineering service, unlimited facilities for producing and assembling. Send drawings, blue prints, or samples for quotations.

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BRONZE CASTINGS

Will you give us your address? We want to give you the important facts about Bronze bearings and castings. Thank you.

LUMEN BEARING CO.
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HEAVY PUNCHINGS

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Washers Our Specialty

70 years Assortment of Punches and Dies enables us to furnish variety of Washers without tool charges.

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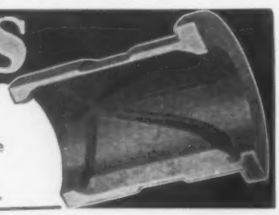
CASTINGS



BRASS — BRONZE
ALUMINUM

All alloys and sizes from one ounce to a ton. Ask for Bulletin A.

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1832 Chestnut St. Erie, Pa.

We Do Difficult Stamping Jobs Well

That *particular* job—why not let our experience and facilities take care of it efficiently, at a reasonable cost?

Send along your blueprints for quotations. MAKERS OF "TROUBLE-FREE" STAMPINGS.

New England Pressed Steel Co.
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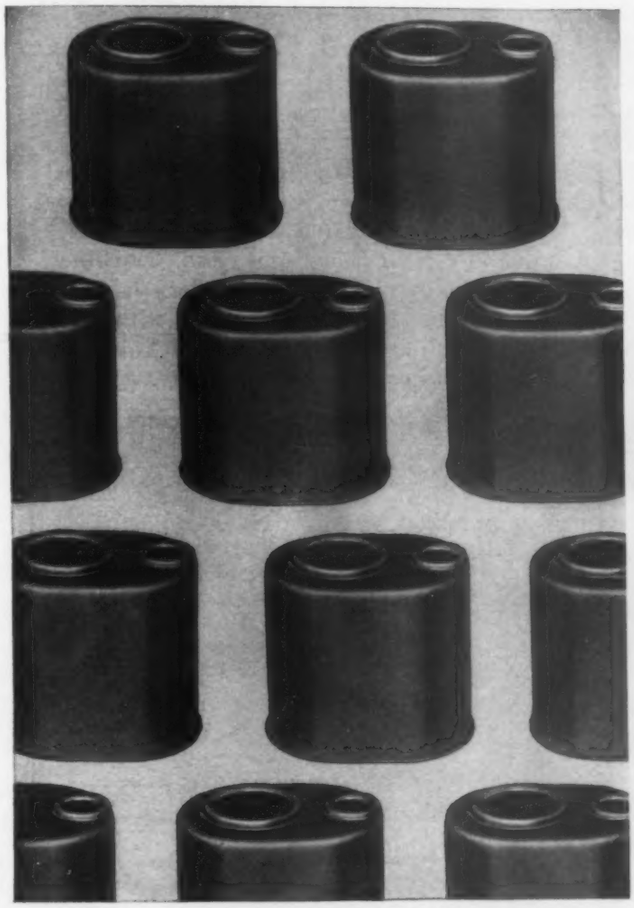
2500 TON
MECHANICAL PRESSES

Are available in Pittsburgh district for contract work in quantity production of heavy stampings.

Address inquiries to

Box D 2 West Side Post Office, Youngstown, O.

Getting New or Improved Products to Market Ahead of Competition



Pressed steel body for automobile jack, produced by G. P. & F. at a 50% saving over cost of aluminum casting formerly used. Greater strength was also secured . . . chances of breakage eliminated.

A Product on the Drawing Board Makes No Profit

IN designing new products or improving present models G. P. & F. pressed metal engineers can assist you, as they have thousands of other manufacturers eager to get modernized products on the market ahead of competition. During fifty years of experimental work in pressed metal fabrication these specialists have accumulated a vast and varied experience in metal forming and stamping. A suggestion from them may not only cut down your designing time, but also add materially to the appearance of your product.

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A blue print or sample part will bring recommendations and quotations promptly.

GEUDER, PAESCHKE & FREY CO.

Sales Representatives in Principal Cities in All Parts of the Country

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338 W. Ohio Street, Chicago, Ill.

G.P.&F. STAMPINGS

GEUDER, PAESCHKE & FREY CO.

1352 St. Paul Ave., Milwaukee, Wis.
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Please send your 1930 Booklet, "In Harmony with Modern Progress," to the address below. It is understood the writer is not obligated.

Name_____

Company Name_____

Address_____

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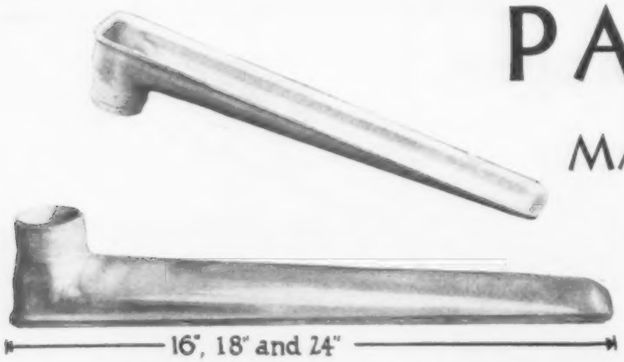
PARISH

MAKES THESE UNIT HEATER HEADERS OF 1/4" PRESSED STEEL



THESE Unit Heater Headers are an excellent example of the kind of work we're equipped to turn out. Made of 1/4" steel, in 16", 18" and 24" lengths and threaded for 3 1/2" pipe, their advantages over cast steel or iron are readily apparent—greater accuracy, a more uniform product, less spoilage, a better looking job—and for less money!

Possibly you are using sand castings now that could be made better and cheaper of pressed steel? Why not let Parish Engineers look your job over and give you their suggestions? They have a broad experience in this class of work.

As for our shop: The finest in press equipment, straight-line production methods, pyrometer controlled heat treating furnaces, splendidly equipped tool and machine shops, pickling equipment, modern laboratory facilities, and a personnel with the "know how" are at your service. Your inquiry won't involve you in any way.

Heat Treated Bus and Truck Frames

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Press Forgings

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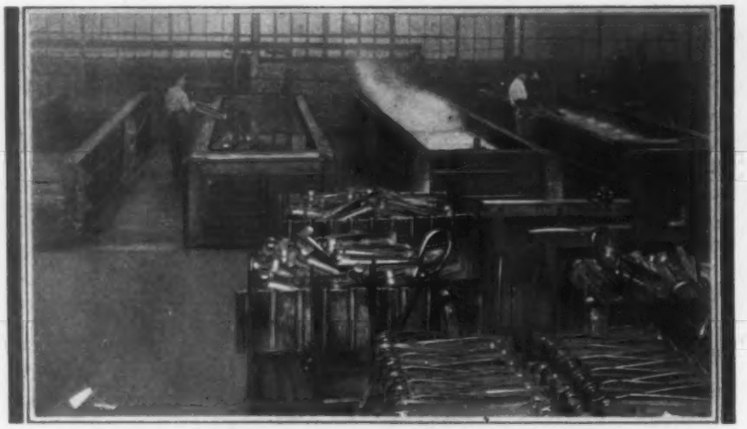
Heavy Gauge Stampings



Section of our pickling department where the waste heat of a quenching furnace supplies steam for the pickling tanks.

PUT IT UP TO Parish

PRESSED STEEL CO.

of READING, PA.

Pacific Coast Representative—F. SOMERS PETERSON CO., 57 California St., San Francisco, Cal.

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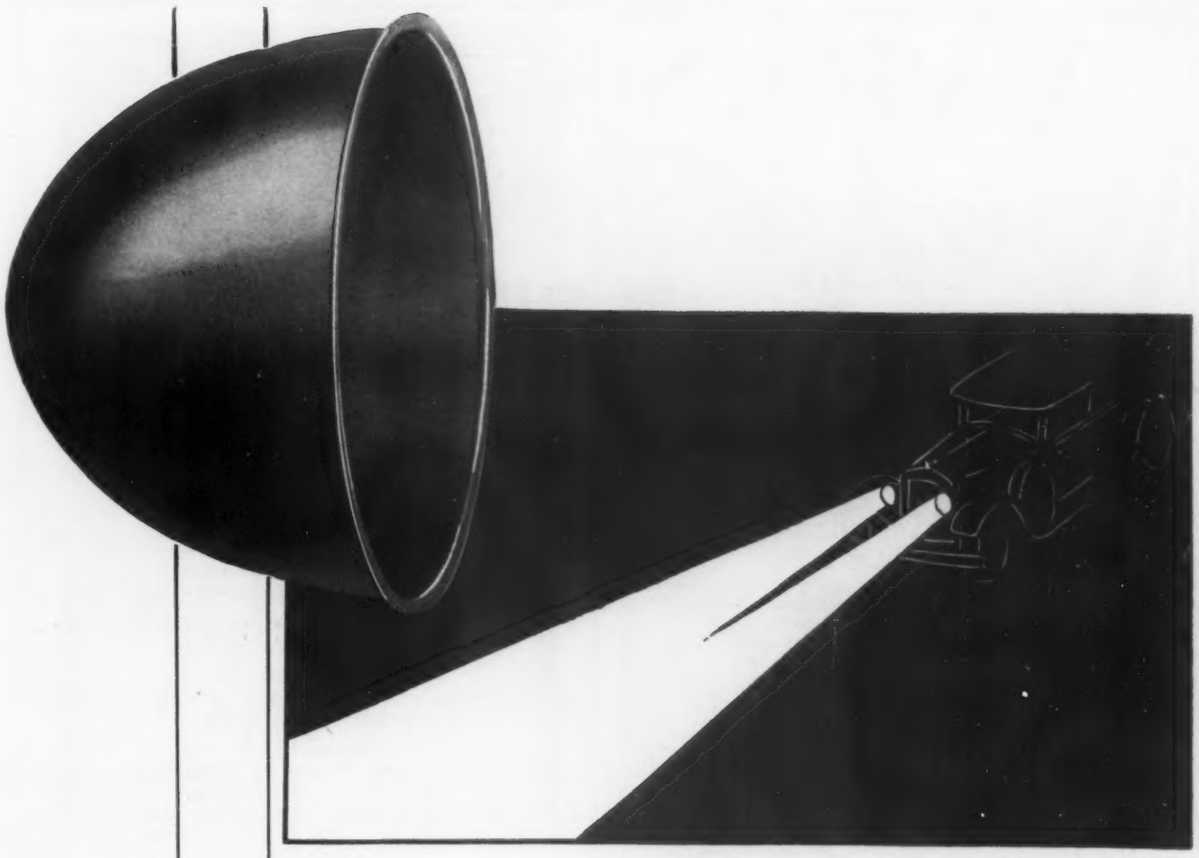
CLUTCHES and TRANSMISSIONS	FRAMES AND STAMPINGS	FRONT and REAR AXLES	UNIVERSAL JOINTS
BROWN-LIPE GEAR CO. SYRACUSE, NEW YORK	PARISH PRESSED STEEL CO. READING PENNA.	SPICER MFG. CORP. TOLEDO OHIO	SPICER MFG. CORP. TOLEDO OHIO



MAKING A BEAM OF LIGHT WALK A CHALK LINE . . . .

On this 18 gauge brass automobile headlight reflector a true surface is necessary for the proper functioning of the light because State Laws insist on proper focusing.

The required accuracy is only obtainable by stamping when done by an organization that has years of experience and skill in the drawing and working of sheet metal.

Bossert stampings have solved for hundreds of manufacturers the problems of accuracy as well as increased strength of parts without increasing weight, of reducing weight, of eliminating machining, of reducing assembly time, and also of reducing cost—

The Bossert equipment and organization with over 30 years' experience are available for the complete solution of your stamping problems.

Send your blue prints for engineering service and quotations.

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Utica, N. Y.

605 Swetland Bldg. Cleveland, Ohio
30 Church Street New York City
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BOSSERT STAMPINGS

STAMPINGS

Redevelopment or Redesigning that Lowers Costs

We specialize in the redevelopment of small and medium castings into lighter, less expensive stampings, and the redesign of stampings to assure greater fitness at lower costs.

If you will forward us drawings or samples with your approximate quantity requirements we will gladly show you where AKRON-SELLE Engineering Service can help you.

Our present customers represent many of the most discriminating parts buyers in the automotive, furniture and general metal goods fields. May we serve you?

We also make Welded Rings and Bands 6" to 60"

The AKRON-SELLE CO.
AKRON OHIO
43 Years in Business

SHUTTER LOUVRES

In any quantity desired. We are in a position at this time to give you an attractive price and prompt delivery.
We also make stamped Louvres with permanent openings to your requirements.

Send Blue Print or Pencil Sketch

THE BREESE BROS. CO.
Cincinnati, Ohio

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TOTE BOXES—SHOP BOXES
—PICKLING BASKETS
FABRICATORS OF
STEEL—IRON—BRASS—COPPER
—MONEL METAL
Requiring
Stamping—Forming—Drawing
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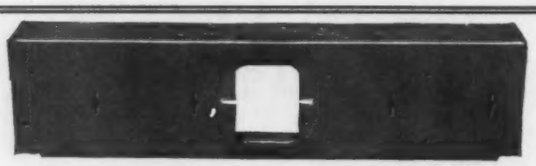
See Data A.S.M.E. Mechanical Catalogue, McRae Hendricks and Thomas Catalogues

Metal Stampings

OURS is a completely equipped plant especially adapted for producing metal stampings of all kinds. Comprehensive facilities also permit assembling of complete units.

We would appreciate the opportunity of competing for your requirements.

The Globe Machine & Stamping Co.
1250 W. 76th St. Cleveland, Ohio



For Example — a Steel Radio Panel

Stampings and shells for every purpose are designed, made, finished and assembled regularly in the Seymour plant. Facilities and experience are adequate for your job. Complete Engineering Service.

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The H. A. Matthews Co.
The Seymour Metal Goods Co.
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STAMPINGS
and
SHEET METAL WORK

Our organization and equipment permit us to guarantee quality product and prompt delivery in any quantity.
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York Corrugating Company, York, Pa.

HEAVY MEDIUM
STAMPINGS
Send Samples or Blue Prints for Estimates
LANSING STAMPING CO.
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Complete facilities for drop forging from 2 ounces to 2 pounds. Finished to Print.

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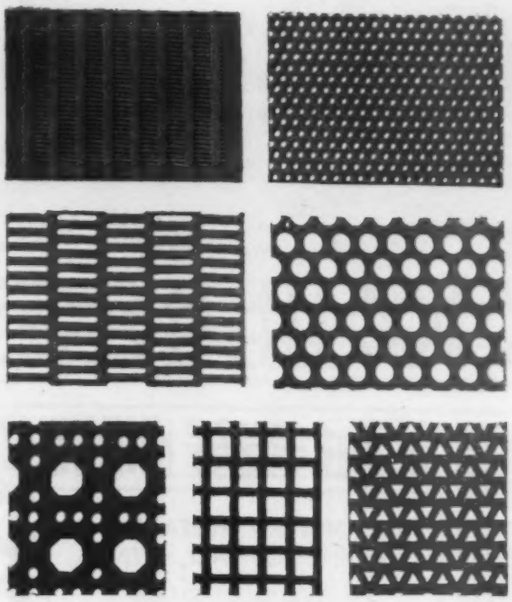
Medium and small stampings with universal equipment for long shapes up to thirty inches.

Automobile Hardware, Butt and Spot Welding, Enameling, Plating

AMERICAN FORGING & SOCKET CO., Pontiac, Mich.



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for every requirement

At Your Service

Our unexcelled plant facilities, large stock of metals, extensive assortment of dies and a long experience in producing Perforated Metal.

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Tin, Steel, Copper, Aluminum, Bronze, Brass, Zinc, and Other Metals and Materials

For Screens, Centrifugal Linings, Filter Press Plates and every other purpose, in an infinite variety and size of perforations.

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SPECIAL WORK?

Our half century of experience and our facilities are adequate to insure the kind of service you require on standard work or work of special nature. Our service department will be glad to co-operate with you.

A stock of Perforated Machinery Guard material always on hand.

Aluminum, Tin, Zinc, Brass, Copper, Steel and Other Metals and Materials

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PERFORATED SHEET METALS OF QUALITY

ROUND, SQUARE, SLOT AND SPECIAL PERFORATIONS for Screens, Grilles, Radiator Covers, and all purposes requiring a strong, flat, easily fabricated and attractive mesh.

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PERFORATED METALS and SCREENS OF ALL KINDS

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PROMPT SHIPMENT

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WROUGHT STEEL
Stampings — Hinges — Washers
C. HAGER & SONS HINGE MFG. CO.
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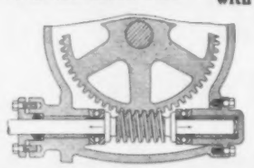
WORM DRIVES operate smoothly with AUBURN THRUSTS



The use of Auburn Ball Thrusts with their minimum of wear and constant thickness insures the least amount of backlash, and avoids jerky starting and stopping of the worm drive.

Auburn Thrusts thus prolong the life of both worm and gear and make a smoother operating machine.

Send details of your problem and ask for data sheets

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Complete Plant
Over 30 Years' Experience
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STAMPED, PRESSED AND DEEP DRAWN PARTS
IN ANY COMMERCIAL METAL AND IN ANY FINISH REQUIRED
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PRESSED STEEL SHAPES
UNUSUAL EQUIPMENT FOR DRAWING, BEADING, FLANGING AND SHAPING
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The BANTAM BALL BEARING CO.
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JOURNAL — RADIAL — THRUST
Ball and Roller Bearings, ½" to 40" in. diameter—
ONE OR A MILLION. Standard and special sizes.

How much can you save with this *Certified* Bearing Metal ?

If "SABECO" wore but twice as long as the bearing metal you are now using the actual dollars and cents saving would be worth while, to say nothing of the further economy in replacement labor, "down time" of equipment and wear and tear on shafts due to worn bearings.

But in most instances "SABECO" gives *three times* the service of other bronzes. In many cases it wears ten times as long; every day it rolls up new records for bearing metal service.

There's nothing in it but pure copper, tin and plenty of lead, but the special "SABECO" process produces an alloy which *will not burn, score, corrode, or pound out, has a lower coefficient of friction and requires less lubrication.*

This is the real secret of "SABECO'S" longer life.

Made in four grades—for every type of service and furnished in ingots, rough and machined castings, and cored and solid bars.

May we send you complete data from which you may judge its "saving-value" to you?

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"SABECO" in CORED and SOLID BARS for Replacement Ask Your Mill Supply Jobber

UNBRAKO

To produce—and at a price—a screw combining strength, hardness, toughness, uniformity, and accuracy as does the "UNBRAKO" is indeed a very great achievement.

For doubting Thomases, however, we have free samples; and if they don't convert you to the "UNBRAKO"—we'll quit.

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FINISHED STOCK BUSHINGS
Send for stock card
BRONZE BARS CORED & SOLID
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IT pays to use good bushings and bearings. They give you greater accuracy and precision over longer periods, without interruptions—adding profits.

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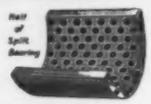
OILLESS BUSHINGS AND BEARINGS

METALINE

(Reg. Trade Mark)
that require no attention
Write for information



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MAC-IT Hollow Safety Set and Cap Screws.
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REASONABLE PRICES

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REPEAT 80 ORDERS

YOUR ORDERS ARE SAFE IN OUR HANDS

IF ITS PULLED FROM THE BAR—WE'LL MAKE IT

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High Lead Bronze

BEARING METAL

This anti-friction bearing metal will greatly decrease your power losses and keep your machinery operating at high speed from 6 to 10 times longer than any other bearing metal.

Equally suitable for heavy duty service in rolling mills, cement machinery, paper machinery, cranes, crushers, locomotives, motors, street cars, grinders, hoisting engines, and many others. Where you now use phosphor bronze, DURBAR is highly recommended as a superior substitute.

In stock bars and special castings DURBAR Bearing Metal is available in standard and Hard grades. Soft and Extra Hard Grades on order.

Let our metallurgical staff assist you.

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Durbar Bearing Bronze in stock bars 12" long in STANDARD and HARD GRADES. Outside diameters from 1¼" by ⅛" to 3½"; by ¼rs to 4½". Inside diameters from ⅝" by ⅛ths to 3¾". Sizes 4¾" to 8" O.D., 4" to 6" I.D., and special castings furnished promptly on special order.

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A *high lead* bronze bearing metal giving the longest service at the lowest cost.

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One Standard of Quality in every Type and Size

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Wood Screws
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Cap Screws
Set Screws
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Available in any finish — nickel, blued, copper, bronze, brass, galvanized, plain, polished, cadmium, chromium.

Reed & Prince Screw Products can be depended upon for unvarying uniformity in strength, finish and dimensions. Every Screw, Nut and Bolt meets the highest standards of quality and accuracy.

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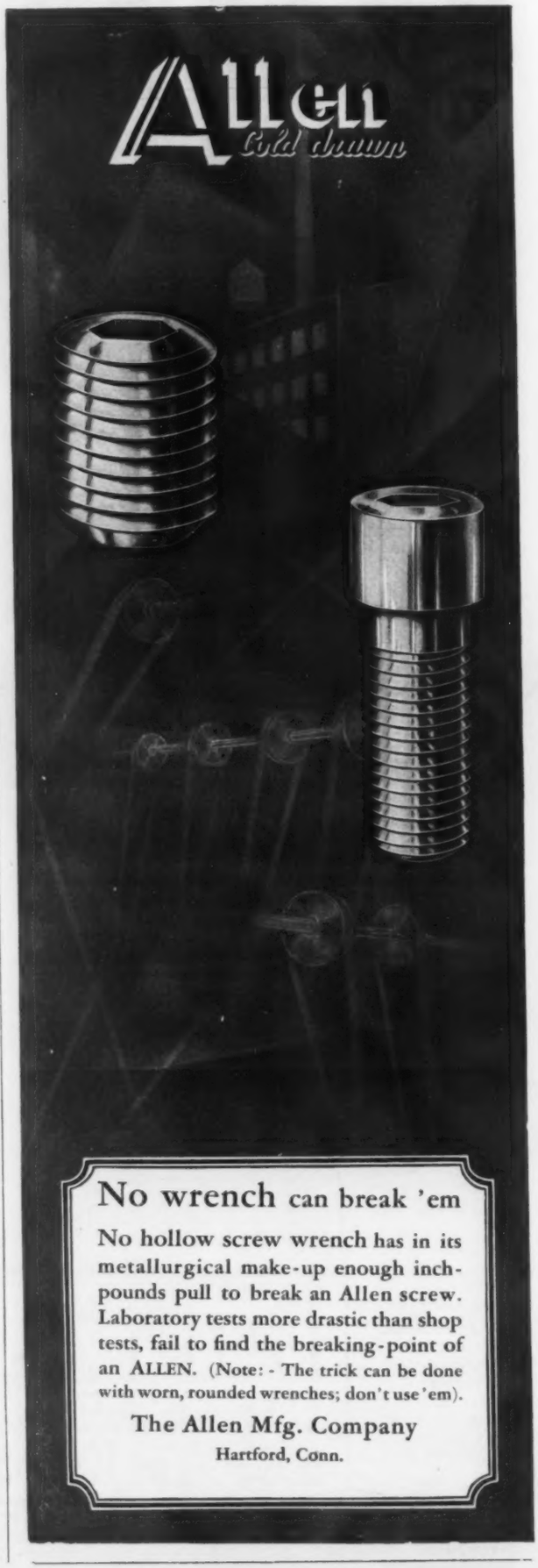

No wrench can break 'em

No hollow screw wrench has in its metallurgical make-up enough inch-pounds pull to break an Allen screw. Laboratory tests more drastic than shop tests, fail to find the breaking-point of an ALLEN. (Note: - The trick can be done with worn, rounded wrenches; don't use 'em).

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Western Factory—Dayton, Ohio

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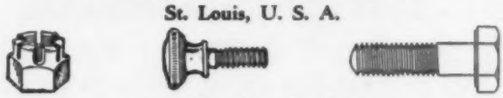

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Castle Nuts—Set Screws—Cap Screws

SCREW MACHINE PRODUCTS
ACCURATELY MADE AT A FAIR PRICE ARE MORE ECONOMICAL
Specialists in the production of screw machine products for 15 years. Let us quote on your requirements.
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Do You Want
SCREW PRODUCTS
That Will Cut Assembly Time?
Olson Screw Machine Products are as uniformly accurate as modern facilities and a background of twenty-five years' experience can produce. Made in steel and brass up to 2¼" in diameter. Let us quote on your work.
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A great many products at present milled from the bar can be developed by our process at a great saving. The illstration shows a variety of products we have developed for other manufacturers by the cold heading process.
If you have similar requirements let our specialists cooperate with you. There is a large price advantage and it will pay you to get in touch with us.
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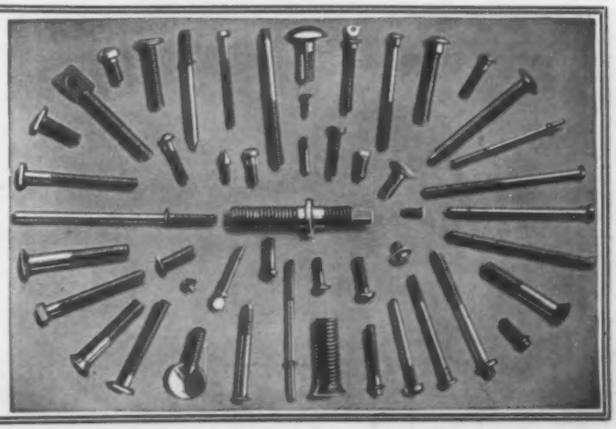
TORRINGTON, CONN., U. S. A.
IN STOCK AT ALL TIMES
Standard Machine Screws
Machine Screw Nuts
Interchangeable bolts and nuts made strictly to A.S.M.E. tolerances.



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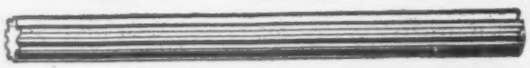

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Our Mills at Lebanon and Scranton carry large stocks and are advantageously located to make quick shipments.

And the price is *right!*

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STEEL BARS, WIRE
of exceptional quality

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CAP AND SET SCREWS
The
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Pattison St. and M. & P. R. R. York, Pa.

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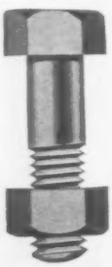

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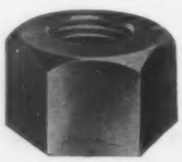

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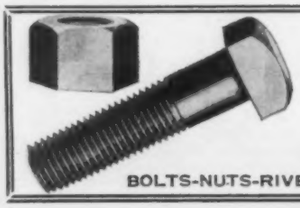

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BOLTS-NUTS-RIVETS-RODS-UPSET FORGINGS

"The next bolts you order, be sure and Specify CLARK'S"

"That trial order of them you got in here the last time was sure a revelation to me—they certainly have the 'stuff' in them."

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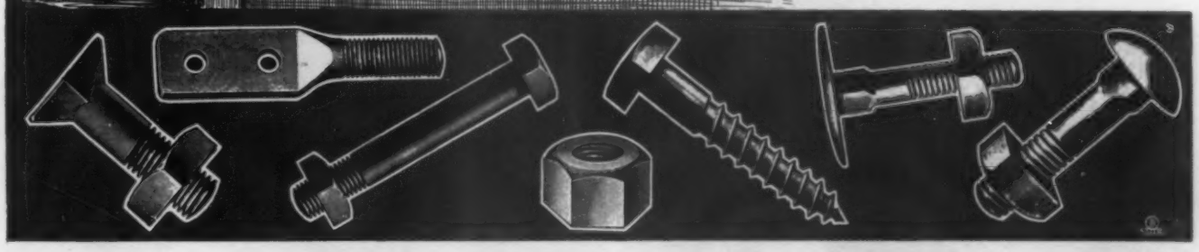

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MALLEABLE IRON
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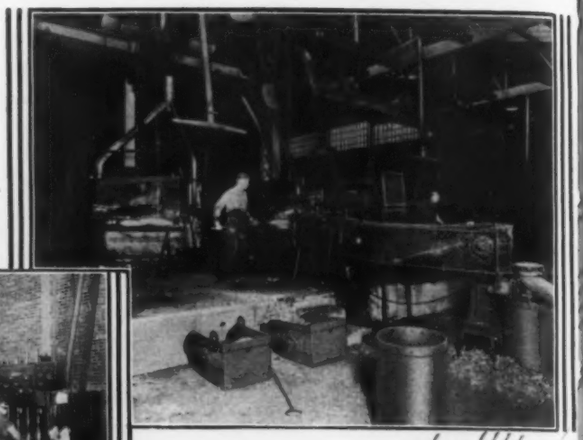

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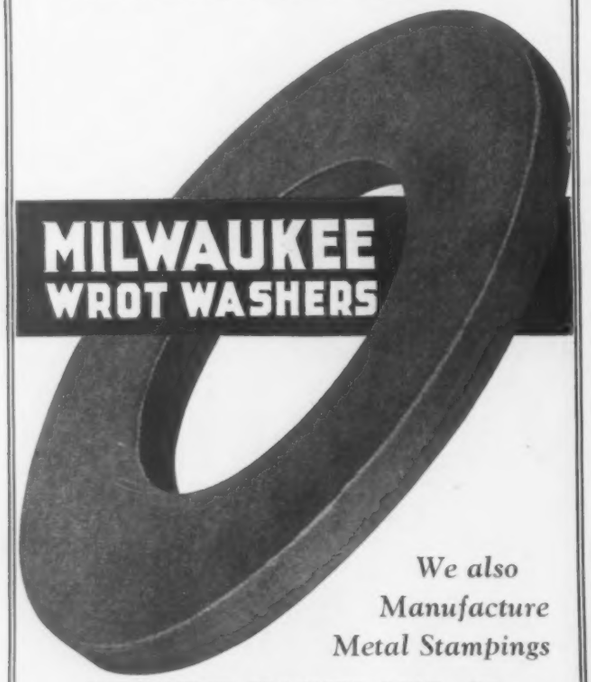

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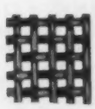
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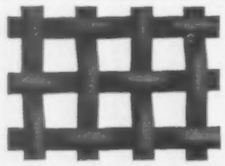

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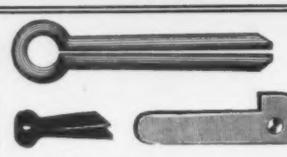

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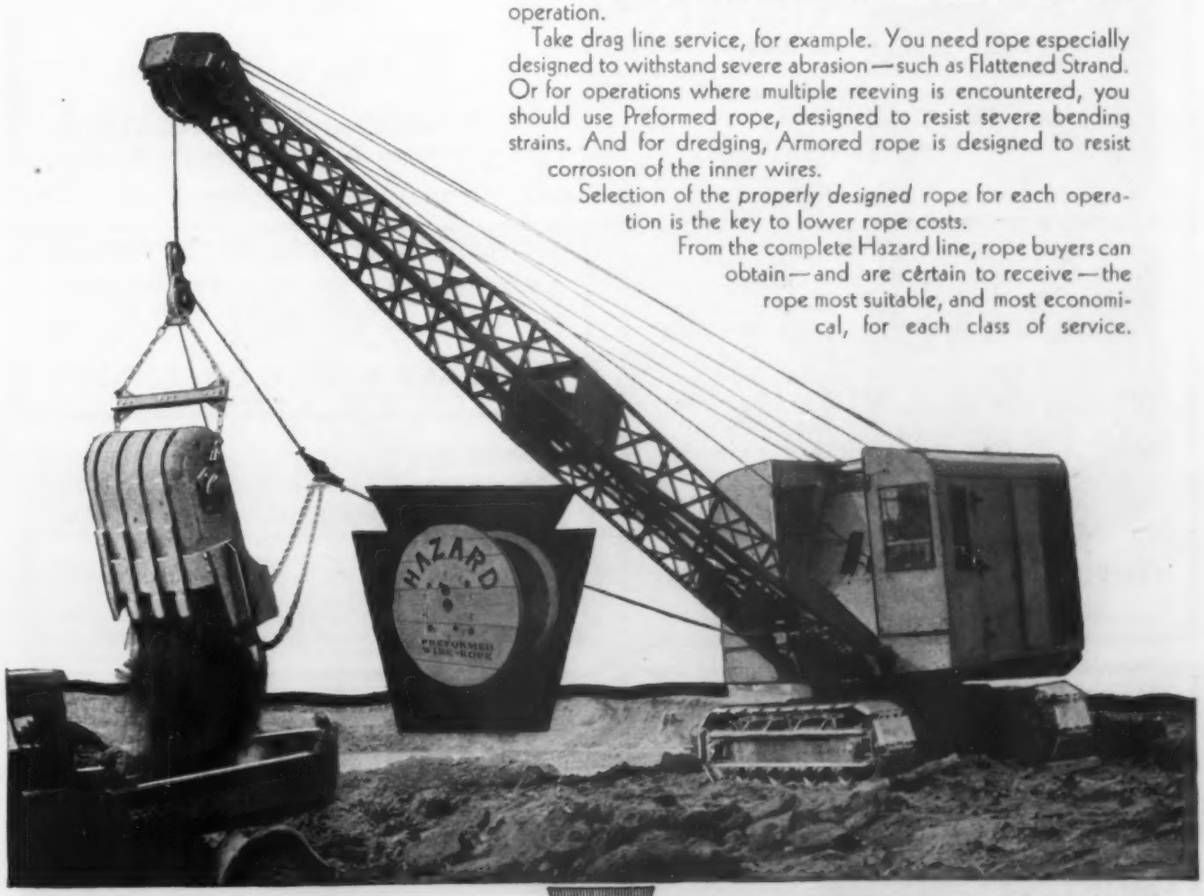

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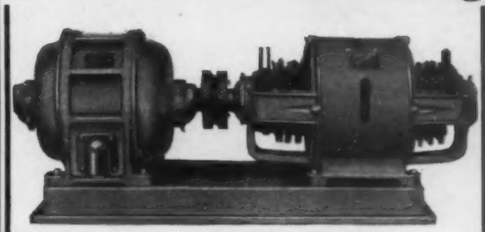

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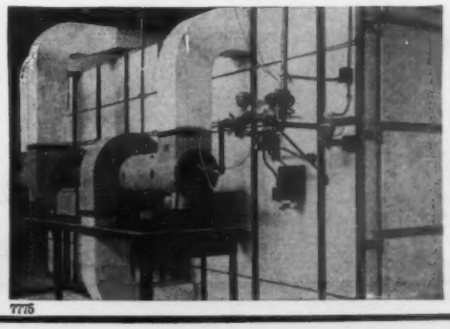
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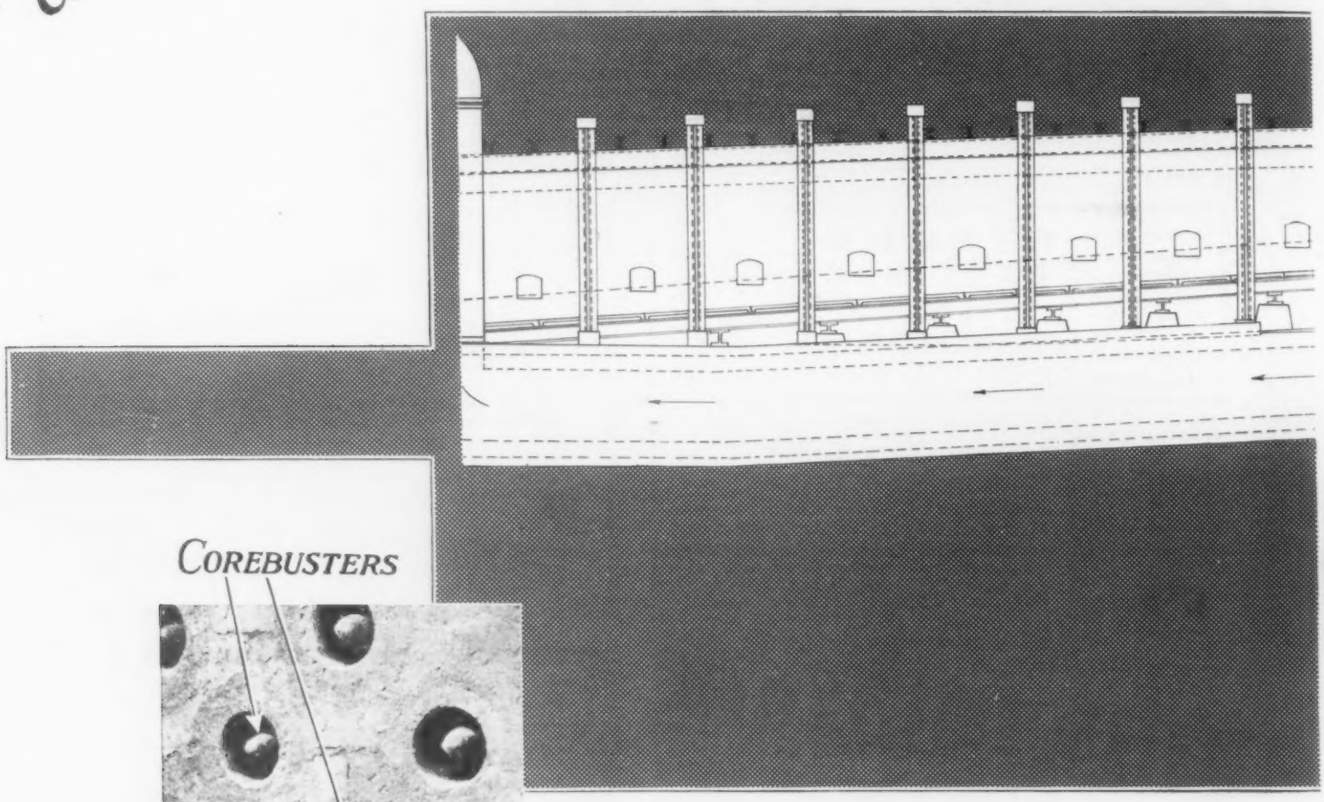
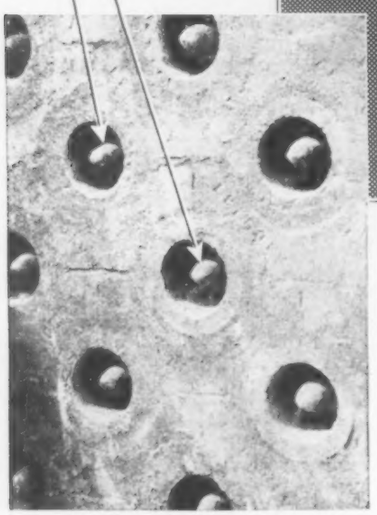


COREBUSTERS



A SECTION OF TERMINAL WALL IN THE CARBORUNDUM RECUPERATOR SHOWING CARBOFRAX TUBES AND COREBUSTERS

(CARBORUNDUM AND CARBOFRAX ARE THE REGISTERED TRADE MARKS OF THE CARBORUNDUM COMPANY FOR ITS PRODUCTS)

THE Carborundum Recuperator illustrated has improved operating conditions to a marked degree in an ingot heating furnace in a prominent steel pipe plant.

With this new principle in recuperation they have not only bettered their actual heating and furnace conditions but also have effected substantial fuel savings.

In this installation waste gases enter the recuperator at 1200° F. and leave at 320° F. These figures indicate the remarkable heat recovery possible with the Carborundum Recuperator.

The actual fuel saving over another furnace of the same size, but not equipped with a recuperator, is $55.00 per day. Both burn natural gas.

The CARBORUNDUM Company
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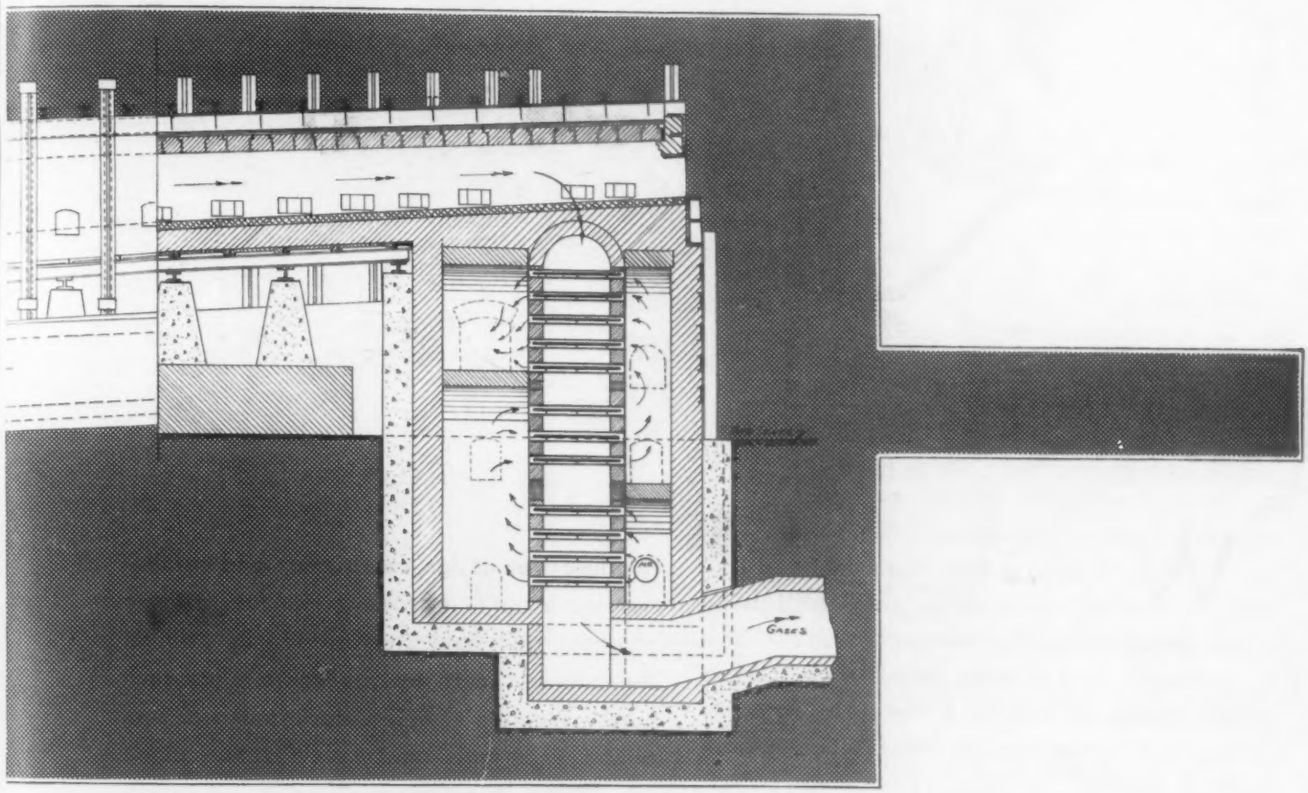
MANUFACTURERS OF

RECUPERATOR

LICENSED UNDER FITCH PATENTS

Improves Furnace Conditions



Operating conditions have been so improved as to insure uniform furnace temperatures and scale has been reduced to a minimum.

The whole secret of the success of the Carborundum Recuperator lies in the use of "Carbofrax" tubes which make possible this new principle and design.

The tubes are fixed, permanent, accessible. There are no moving parts.

"Carbofrax," the Carborundum Brand Silicon Carbide Refractory, has such a high rate of heat transfer and the heat is taken away from the tubes so fast that the whole structure is always safe from destructive temperatures.

The tubes remain straight and the terminal walls tight.

Such a condition makes possible the use of relatively high velocity of air passing through the tubes—which in turn increases the rate of heat transfer.

The use of corebusters facilitates this action.

Another thing, the Carborundum Recuperator saves on floor space and can be just as successfully applied to many other types of furnaces.

Our Engineering Department will gladly discuss the details with you

Refractory Division, Perth Amboy, New Jersey

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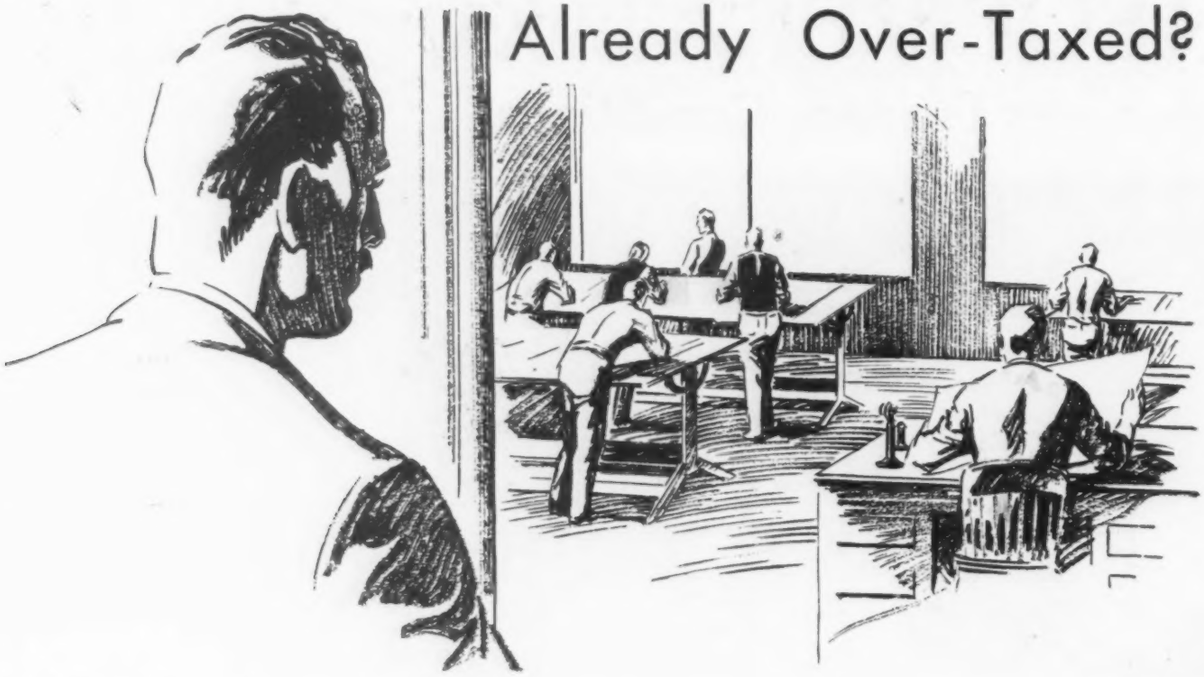

WAS there ever a time when cost saving revisions in your production equipment merited greater attention . . . or a time when your Planning Department had less opportunity to undertake the detailed study required in working out these requirements?

Oven treatment is frequently in this class of problem because it has such a wide range of industrial applications.

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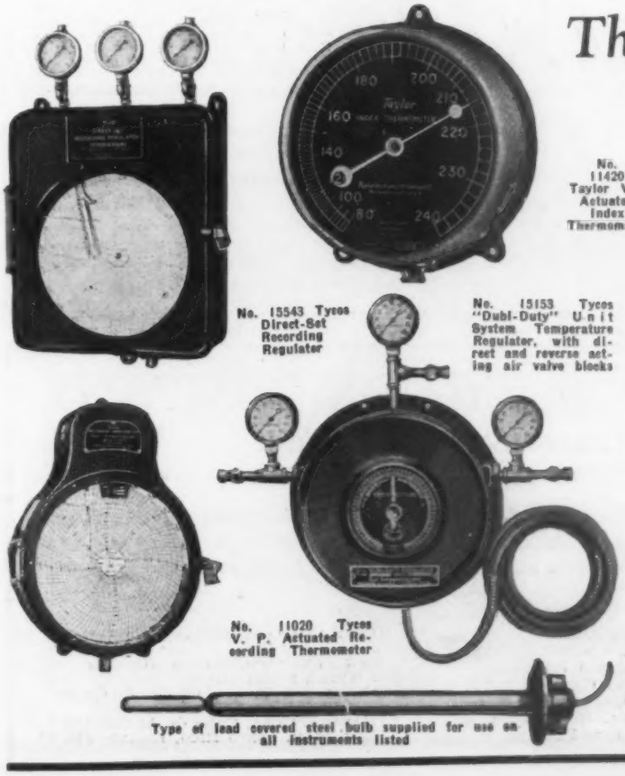

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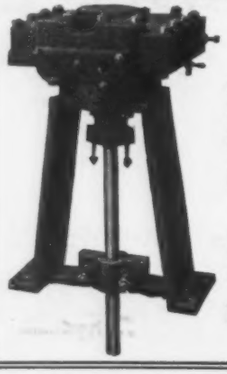

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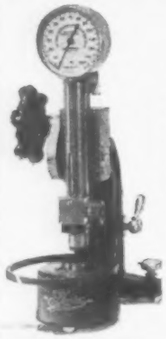

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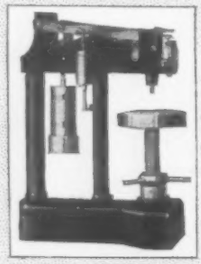

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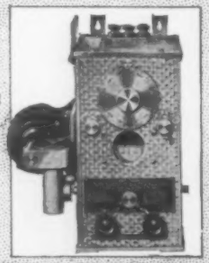

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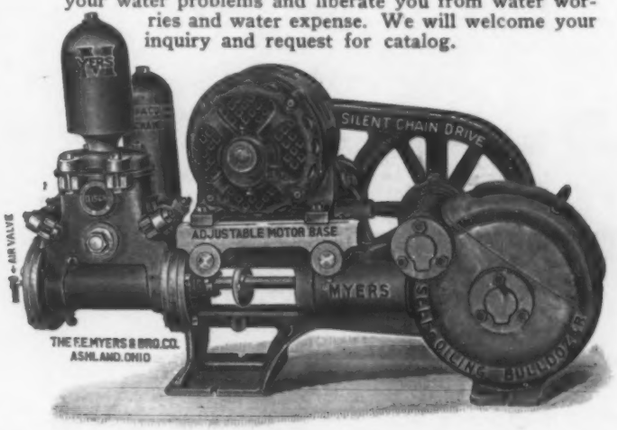

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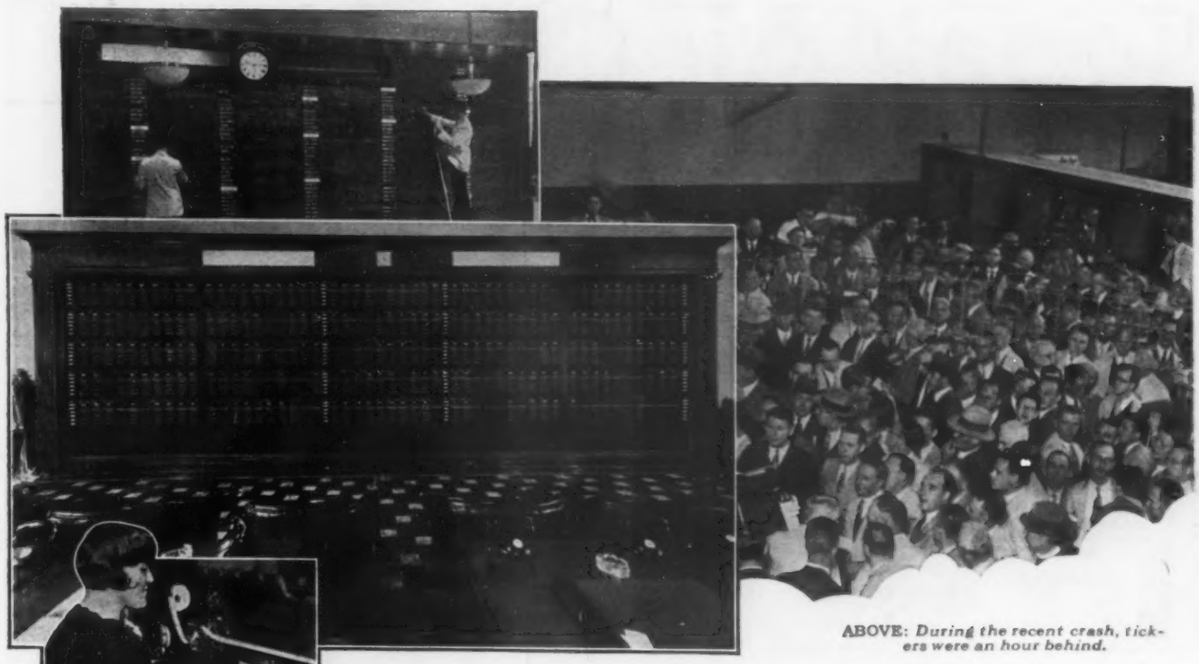

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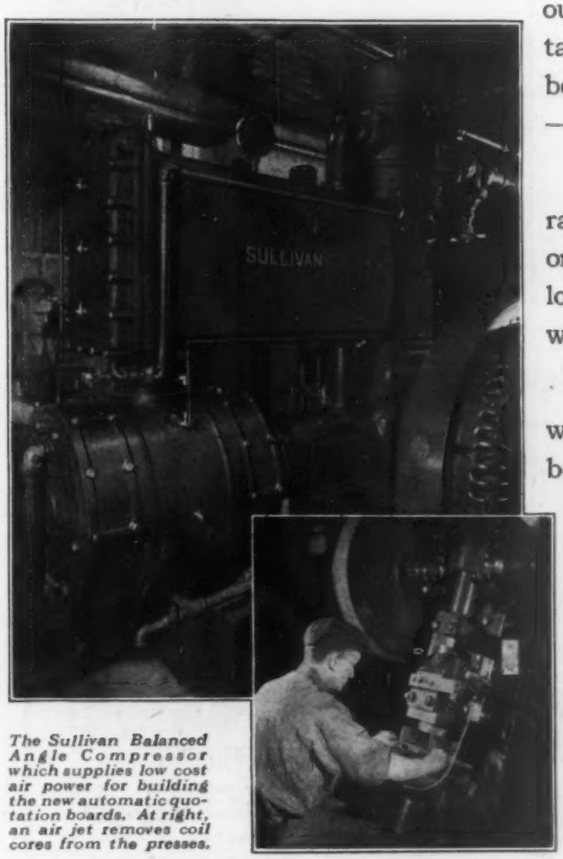

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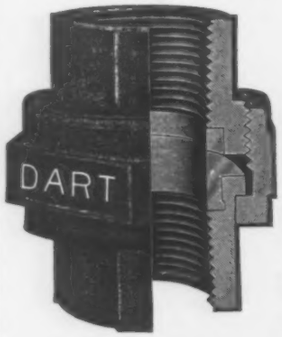

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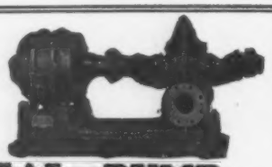

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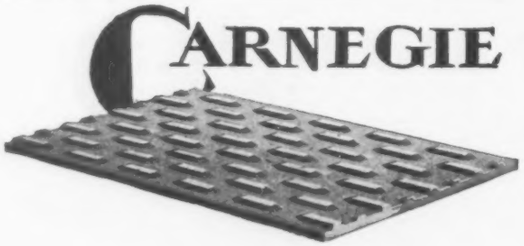

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15

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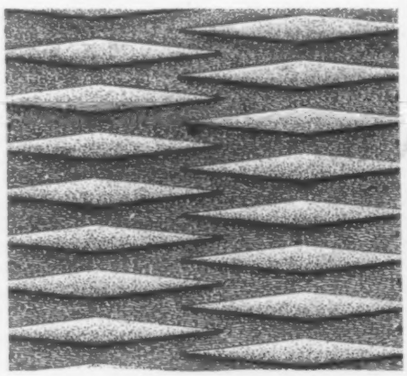

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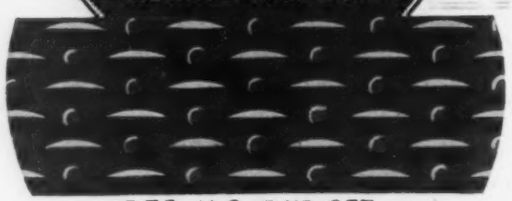

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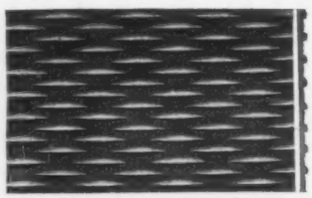

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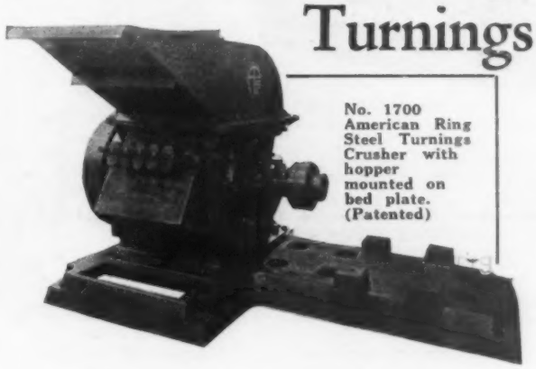
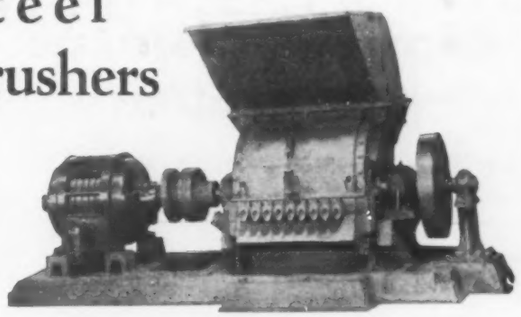
American Ring Steel Turnings Crushers



No. 1700 American Ring Steel Turnings Crusher with hopper mounted on bed plate. (Patented)



No. 3800 American Ring Steel Turnings Crusher with hopper mounted on bed plate. (Patented)

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1—36"x14' Johnson.
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1—30"x11' H. S. & G.
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3—26"x16' N.-B.-P.
3—26"x16' Whit.-Blaisdell.
10—26"x16' Bridgeford.
3—26"x14' Bridgeford.
5—26"x14' N.-B.-P.
3—26"x13' Wickes.
3—26"x12' Putnam.
5—26"x12' Bridgeford.
13—26"x11' Wickes.
40—26"x10' N.-B.-P.
10—26"x10' Canada.
15—26"x10' Whit.-Blaisdell.
14—26"x10' Bridgeford.
11—26"x 9' Bridgeford.
4—26"x 8' Bridgeford.
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5—20x22"x12' American.
2—20-22"x8' American, M.D.
30—20-22"x8' American.
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1—17"x 6' LeBlond Mfg.
1—16"x12' Monarch.
1—16"x12' Sundstrand Mfg.
1—16"x10' Sundstrand Mfg.
1—16"x 8' American, Gd. Hd.
1—16"x 8' Hendey.
1—14"x12' LeBlond, Gd. Hd.
1—14"x10' Pratt & Whitney.
1—14"x 6' LeBlond.
2—14"x 6' Lodge & Shipley.
2—14"x 6' Flather.
5—3 ½"x60' Fitchburg Loswing.
1—3 ½"x108' Loswing.

Vertical Milling Machines

1—No. 1 Becker.
2—No. 4-B Becker.
1—No. 2-B Milwaukee.
1—No. 4 Cincinnati.
1—No. 5 Becker.
1—No. 5-B Becker.
6—No. 6 Becker.
1—Model CS Becker.
2—Model SD Becker.
1—Model ACS Becker.

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1—72x84"x12' Gray.
1—60x48"x12' N.-B.-P.
1—56x56"x22' Cincinnati.
1—56x56"x16' Cincinnati.
1—48x48"x16' N.-B.-P.
1—48x48"x16' Gray.
1—48x48"x16' N.-B.-P.
3—36x36"x18' Cincinnati.
1—36x36"x16' Ohio.
1—36x36"x16' N.-B.-P.
1—36x36"x10' Whitcomb-Blaisdell.
2—36x36"x 8' Ohio.
1—36x32"x 8' Cincinnati.
1—30x30"x14' Niles-Bement-Pond.
1—26x26"x10' Gray.
2—24x24"x 6' Gray.
1—24x24"x 6' Flather.
2—24x24"x 6' Woodward-Powell.
1—24x24"x 6' American.

Vertical Boring Mills

1—14'-20' Niles Extension.
1—10' Niles.
1—96" Betts.
1—72" Pond.
1—72" Niles.
1—61" Baush.
1—60" Pittsburgh.
1—54" Bullard.
1—52" Gisholt.
1—51" Baush.
1—51" Bullard.
1—48" Colburn.
2—42" Gisholt.
3—42" King.
1—42" Colburn.
1—30" Bullard New Era.
1—36" Bullard Rapid Prod.
1—36" Gisholt.
2—32" King.
1—30" Flather.
1—30" Gisholt.

Milling Machines

1—No. 5-B Becker-Brainard.
1—No. 3 Cincinnati.
1—No. 3-B Brown & Sharpe.
3—No. 3 Brown & Sharpe.
1—No. 2-B Milwaukee.
1—No. 21 Brown & Sharpe.
2—No. 2-Y Brown & Sharpe.
2—No. 2 Cincinnati.
1—No. 2 Kempsmith.
1—No. 1-B Milwaukee.
1—No. 1 Brown & Sharpe.
2—No. 20 Oesterlein.
1—No. 1½ Rockford.
7—No. 25 Becker.
8—No. 0 Brown & Sharpe.
1—No. 2-M Cincinnati Univ.
1—No. 1 Kempsmith Univ.
1—No. 20 Oesterlein Univ.
3—Type B Briggs.
1—12" Cincinnati B. G. Mfg.
3—18" Cincinnati Auto.
1—24" Cincinnati Auto.
1—48" Cincinnati Auto.
1—Putnam, Semi-Auto.
2—No. 33 Kempsmith, 60" Feed.
175—P. & W. Hendey, Becker and Garvin Lincoln Millers.
1—No. 3 Sundstrand Rigidmill.

Auto Screw Machines

3—No. 52 National Acme.
1—1x5" 6-spdle. New Britain.
5—1¼" 4-spdle. Gridley.
2—2¼" Gridley, Single Spdle.
1—No. 33 New Britain.
1—No. 2-P Potter & Johnston.
4—No. 3-A Potter & Johnston.
6—No. 6-A Potter & Johnston.

Slab Milling Machines

1—24x13"x36' Ingersoll.
1—24x24"x12' Ingersoll.
1—36x30"x7' Newton.
1—45x17½" Ingersoll.
1—50"x20' Ingersoll.
1—No. 3 92x54"x15' Beaman & Smith, Milling and Boring Machine, Planer Type.
1—Beaman & Smith openside.
1—3 spdl. Beaman & Smith.

Turret Lathes

2—26" Libby.
26—24" Davis.
8—24" Steinle.
5—24" Gisholt.
3—21" Gisholt.
1—18" Libby.
1—No. 3 Cincinnati Acme.
2—No. 2-A Warner & Swasey.
1—No. 3-A Warner & Swasey.
1—No. 6 Warner & Swasey.
1—21x8" LeBlond.
2—No. 6 Brown & Sharpe.
3—3x36" Jones & Lamson.
3—2-spdle. Jones & Lamson
1—18" W. & S.
4—16" Cincinnati-Acme-Fox.
1—14" Warner & Swasey.

Gear Cutters and Hobbers

1—No. 5 60" Brown & Sharpe.
2—No. 36H Gould & Eberhardt.
9—No. 12 Barber-Colman.
4—No. 6 Fellows.
1—No. 91 Fellows.
1—No. 18-H Gould & Eberhardt.
1—No. 36-BM Gould & Eberhardt.
1—12x24" G. & E.
1—No. 1 Schuchardt & Schutte
1—12x16" G. & E.
1—No. 3 Barber-Colman.

Horizontal Boring Machines

1—No. 1 Cleveland.
1—3" Bar Rochester.
1—3" Bar Ingersoll.
1—3-spindle Espen-Lucas Boring, Milling and Drilling Machine.
1—Beaman & Smith Cylinder Boring and Milling Machine.
1—No. 2 Barnes Hor. Radial.
4—No. 1 Barrett.
2—No. 2 Rockford.
1—7x60" Springfield Spindle Borer.

Presses

1—No. 54 Bliss.
1—No. 4 Walsh O. B. I.
1—No. 4½ R. & K.
1—No. 10 Zeh & Hahnemann.
1—No. 57 Toledo Nosing Press, continuous stroke.
5—No. 58 Toledo Nosing Press continuous stroke.
1—No. 59 Toledo Doub. Grdr.

Hand Screw Machines

1—No. 10 2" Bardons-Oliver.
3—No. 8⅞" Warner & Swasey.
1—No. 10 Foster.
1—No. 7 Foster.
1—No. 6 2¾" Warner & Swasey.
3—1" Pratt & Whitney.
1—1½" Pratt & Whitney.

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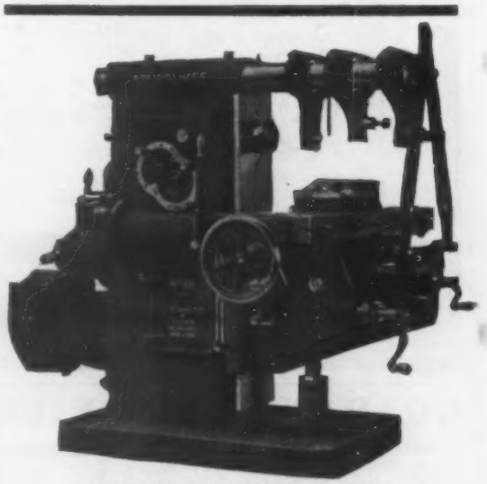

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1—3-spindle Leland-Gifford.
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1—No. 2 4-spindle Foote-Burt.
1—No. 4 4-spindle Foote-Burt.
1—No. 17 4-spdl. Foote-Burt.
1—No. D-31 Fox Mult.
1—No. 12-C Fox Mult.
1—No. 13 Natco Mult.
1—No. 14 Natco Mult.
1—No. 14 Fox Mult.
1—No. 26-AC Fox Mult.
1—No. 2 Western Mult.
1—No. 3 Western Mult.
1—No. 25 36" Foote-Burt.
1—23" Barnes, Self-Oiling.
2—24" Foote-Burt.
1—No. 25 24" Foote-Burt.
1—21" Weigle.
1—28" Hoefer.

Shapers

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1—16" Columbia.

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1—6' Western Hvy.
1—5' Cincinnati-Bickford.
1—5' American, motor on arm.
1—4' American.
1—4' Bickford.
1—3' Western.
1—2½' Gang.

Grinders

1—20x27½x96" Norton Gap.
1—18x96" Norton.
1—16x52" Landis.
1—16x48" Landis Crank Pin Grinder.
1—14x72" Norton.
3—14x50" Norton.
5—14x36" Norton.
2—12x36" Modern.
2—10x72" Norton.
2—10x72" Landis.
3—10x52" Landis.
8—10x50" Norton.
1—10x36" Norton.
5—10x30" Landis.
2—10x24" Landis.
1—10x24" Norton.
1—No. 40 Bryant Wide Wheel.
2—No. 12 8x36" B. & S.
10—6x32" Norton.
1—5x18" Ott Plain Grinder.
1—No. 2 Bath Universal.
2—No. 1 Landis Univ.
1—No. 1 Modern Univ.
1—No. 60 Heald.
8—No. 70 Heald.
1—No. 10-A Bryant Internal.
2—No. 30 Bryant Internal.
1—18" Graham Surf.
1—14" P. & W. Vert. Surf.
1—12" Heald Rotary Surf.
1—No. 20 8" Heald Rot. Surf.
1—8" Arter Rotary Surf.

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1—No. 1 Garvin Tapper.
1—3½" Hendey Centering.
1—Type "PJ" Oilgear Assembling and Forcing Press.
10—No. 1 Garvin Profilers.
15—Betts Profilers.
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1—24" Niles Grd. Slotter.
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1—Henry & Wright 25 ton Dieing Mch.
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10—H.P. Townsend No. 1 Riveters.

BORING MILLS
1—Rochester No. 2 Horiz. 3" Bar.
1—Beaman & Smith No. 10 Horiz., 3½" bar.
1—Colburn 34" Vertical.
1—Bullard 24" New Era.

GRINDERS
1—Pratt & Whitney 14" Vertical Surface.
5—Heald No. 85 Internal.
3—Heald No. 70 Internal (Clutch in head type).
1—Landis 16-in.x52-in. Plain Cyl.
2—Brown & Sharpe No. 2 Surface.
1—Gardner No. 79 Horiz. Disc. Motor Driven.
1—No. 3 Wilmarth & Morman Surface.
4—Norton 6"x32" Plain Cyl.

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GEAR CUTTERS
2—Barber-Colman No. 2 Gear Hobbers.
1—Gleason 24-in. Bevel Gear Planer.
6—H. Pfauter Gear Hobbers.
4—Brown & Sharpe No. 3—26-in. Automatic.
3—Gould & Eberhardt No. 18 H.M. Gear Hobbers.

SHAPERS
10—Hendey 15" Friction.
1—Stockbridge 34" B.G. Crank.
2—Potter & Johnston 15 in. Univ. Crank.
1—Milwaukee 16-in. Crank.
6—Gould & Eberhardt 14"—16"—20"—B.G. Crank.
3—American 15-in. Universal Crank.

MILLERS
10—P. & W. 4" Spline.
4—Kempsmith No. 1 Plain.
1—Cinn. No. 2 Vertical.
1—Kempsmith No. 33 Production.
16—Pratt & Whitney 4½-in.x12-in. Thread.
20—Pratt & Whitney, 5-in. Automatic.
75—Lincoln Type Millers.
12—Brown & Sharpe No. 12 Plain.
3—Milwaukee No. 1½—No. 2 Plain Dbl. Overarm.
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10—Garvin No. 21 Plain Millers, Geared.
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12—National Acme No. 56 2¼-in. cap. 4 spdle. Auto Screw Machines.
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15—Gridley 1¼-in. Auto. 4 SP.
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1—36"x36"x10' W-Powell
1—36"x36"x10' N-B-Pond
1—36"x36"x13' Gray
1—36"x36"x12' N-B-Pond
1—36"x36"x12' D & H Openside
1—36"x36"x14' N-B-Pond
1—48"x48"x10' D & H Openside
1—48"x48"x12' N-B-Pond
1—48"x48"x14' W-Powell
1—60"x60"x14' Powell
1—60"x60"x18' Cincinnati
1—72"x72"x16' D & H Openside
1—72"x72"x18' D & H. Openside
1—10'x5'x16' N-B-Pond
1—120"x120"x20' Bement.

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1—No. 0 D-Harvey 3½" bar
1—60" Niles-B-P.
1—No. 3 Betts-Horizontal
1—No. 3 Barrett Horizontal
1—Espen Lucas 6" bar
1—Newton 7" bar
1—Barrett 6" Bar
1—24" Bullard Rapid P. Vertical
1—34" Bertram Turret Head
1—34" Bullard Vertical
1—34" Colburn Vertical
1—37" Bridgeport Vertical
1—42" Bullard Rapid Traverse
1—42" Bullard Vertical
1—44" Putnam Rapid Traverse
2—44" N-B-Pond Rapid Traverse
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1—96" N-B-Pond Motor Drive
1—100" Sellers Rapid Traverse
1—10-16' Niles Rapid Traverse
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1—1-spindle Edlund
1—1-spindle Perlie
3-1-spindle Allen
1—1-spindle Kern
1—1-spindle H-Wright Class I
4—1-spindle Henry-Wright
1—2-spindle Reed
1—2-spindle Allen
1—2-spindle Edlund No. 2-B
1—3-spindle 23" Rockford Gang
1—3-spindle Sipp
1—4-spindle Edlund
5—4-spindle Rockford 23" Gang
1—4-spindle Barnes 29" Gang
1—4-spindle Barnes 24" Gang
1—4-spindle Leland-Gifford
1—4-spindle Sipp
1—6-spindle Avey
2—No. 2-D Moline
1—6-spindle Foote-Burt Boring
1—No. 3 Baush Mult. spindle
1—No. 4 Baush Mult. spindle
1—No. 11-D Moline Hole Hog
1—No. 15 Natco Multiple
1—No. 32 Natco Multiple Tapp. Att.
1—No. 37 Natco Multiple
1—21" Hoeffer BG Drill
1—22" Aurora sliding head
4—25" Weigle sliding head
1—26" Prentiss sliding head
1—30" Prentiss sliding head
1—30" Snyder sliding head
1—34" Prentiss sliding head
1—42" Cin.-Bickford sliding head
1—No. 1-D Colburn Heavy Duty
2—No. 310 Baker Heavy Duty
2—No. 2-D Minster Heavy Duty
1—No. 2-D Colburn Heavy Duty
1—Henry-Wright Class H
1—42" Canedy-Otto Wall
1—3' Dreses Plain Radial
1—4' Bickford Plain
1—4' American Plain
1—5' Western Plain
1—7' Dreses Plain
1—5' Bickford Universal
1—5' N-B-Pond Universal
1—6' American Universal

PRESSES

1—No. 102 Ferracute Press
1—No. 103 Ferracute
1—No. 56 Toledo Straight Column
1—No. 55 Ferracute Drawing
1—No. 77 Bliss Punch
1—No. 69 Bliss Cam
1—15-ton Lucas Forcing
1—15-ton Metalwood Forcing
1—No. 92½-C Toledo Double Crank
1—No. 167½ Toledo Toggle
1—No. 168¾ Toledo Toggle
1—No. 14-B Bliss Toggle
1—No. 2 Niagara Power
2—No. 19 Bliss Inclinable
1—D-3 Ferracute Press
3—No. 20-C Bliss Inclinable
1—No. 2½ Consolidated Inclinable

SHAPERS AND SLOTTERS

1—6" Pratt-Whitney
1—14" Rockford
1—16" Stockbridge
1—16" Milwaukee
1—20" Hendey
1—20" Kelley
1—20" Steptoe
1—24" Simmons
1—24" Gould & Eberhardt
5—Swing Slotters
1—15" Dill
1—15" Newton
1—20" Bement
1—22" Bement-Miles

PUNCH AND SHEARS

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1—Cleveland Type G single end
1—No. 4 Hilles-Jones Punch
2—No. 5 Hilles-Jones Shear
1—No. 6 Hilles-Jones Punch
1—N. 3 Hilles-Jones Beam Punch
1—No. 0 Hilles-Jones Dbl. End Punch
1—No. 3-A Royersford Dbl. End Punch
1—5"x5"x Corlin No. 2 Alligator
1—8' Bertsch Power Squaring

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2—6" Gleason Generators
1—15" Gleason Generator
13—18" Gleason Generators
1—24" Gleason Planer
1—No. 1 Standard Auto.
1—No. 13 Brown-Sharpe
1—36" Gould-Eberhardt
1—60" Brown-Sharpe
2—90" Pratt-Whitney
2—No. 5 Barber-Colman
1—12-H Gould-Eberhardt Hobber
1—No. 12 Barber-Colman Hobber
1—90-H Gould-Eberhardt Hobber
1—48" Gould-Eberhardt Rack Cutter
1—No. 1 Cross Gear Tooth Rounder

TURRET LATHES AND SCREW MACHINES

1—1x15" Pratt-Whitney
1—1½x9 Acme
1—1½x18 Pratt-Whitney
1—2x26 Jones-Lamson Turret
7—2x26 Pratt-Whitney
2—2½x26 Acme Flat Turret
1—No. 2½ S. S. G. Garvin Screw Mch.
3—3x36 Pratt-Whitney
1—4½x20 Bardons Oliver
3—18" Libby Turret
1—21" Gisholt
1—24" Gisholt
1—No. 1 Warner-Swasey Turret
1—No. 2 Warner-Swasey
2—No. 2-A Warner-Swasey Turret
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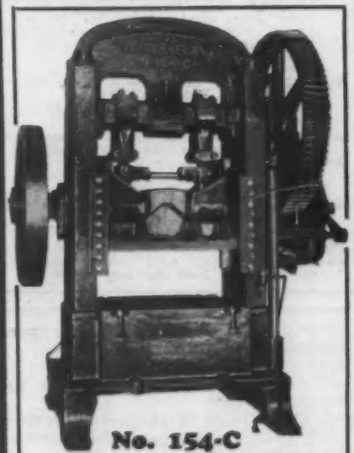

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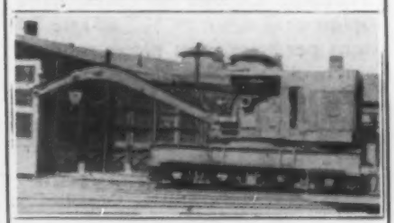

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Employment Exchange

HELP WANTED

SALESMAN: COLD ROLLED STRIP STEEL AND FLAT WIRE. OPPORTUNITY TO BECOME ASSOCIATED WITH OLD ESTABLISHED PRODUCER IN THE EAST. PRIOR SALES EXPERIENCE AND FAMILIARITY WITH THE PRODUCT ESSENTIAL. PREFERENCE WILL BE GIVEN TO MAN BETWEEN THIRTY AND THIRTY-FIVE YEARS OF AGE. APPLICANTS TO RECEIVE CONSIDERATION MUST DESCRIBE EXPERIENCE AND STATE AGE, MARRIED OR SINGLE, SALARY EXPECTED, WHEN AVAILABLE. ADDRESS BOX G-121, care *The Iron Age*, 239 W. 39th St., New York.

ENGINEER for efficiency work with progressive company of highest rating, manufacturing medium and heavy machinery. Preferably experienced in this type of work and with both practical and technical training. This is no ordinary position, but a real opportunity and future for the right man with ability combined with initiative and common sense. Give full particulars as to experience, age, references and salary expected. Application considered confidential. Address Box G-124, care *The Iron Age*, 239 W. 39th St., New York.

WANTED AT ONCE—A foundry foreman capable of supervising general malleable iron foundry conditions, particularly in regard to the proper gating and heading of castings. Must have had a lengthy experince in connection with moulding and moulding machines and able to organize the men in such a manner that maximum production can be obtained. State age, and full particulars regarding past experience. Present capacity of foundry 600 tons per month. Address Box G-125, care *The Iron Age*, 239 W. 39th St., New York.

MANUFACTURERS SALES AGENTS WANTED in all principal cities of the United States to act as our representatives in handling Nopak Air Operating Valves. This is the newest type of valve on the market and unexploited territory is now being assigned. Applicant must be established and be acquainted with manufacturing concerns, foundries, etc., in their respective city and district. Address Galland-Henning Manufacturing Company, 1250 26th Ave., Milwaukee, Wis.

METALLURGIST for a Steel Plant producing plain and alloy steel billets, bars, sheets, plates, strip and wire from electric furnace steel. Must be well grounded in heat treatment and metallography. Prefer man with equivalent M.S. degree in metallurgical engineering, and at least five years' practical experience. In applying give age, salary expected and full details concerning training and experience. Good opportunity for right man. Address Box G-76, care *The Iron Age*, 239 W. 39th St., New York.

SALESMEN, entire time or side line. Nationally and foreign known product, for factories, mill supply houses, farms; 40% commission. A-1 product, and steady repeat business. Established firm. Customers write in, we have the best product of its kind on the market. Address B. G., Box E-739, care *The Iron Age*, 239 W. 39th St., New York.

SALES REPRESENTATIVES in exclusive territories who can qualify to sell our refractories for industrial and steam boiler furnaces. SYROSIL is used by Studebaker and is infusible at 3400 deg. Fahr. Resists slag action of poor grades of coal and iron oxides. Liberal commission only. No advances or drawing accounts. SYROSIL COMPANY, Elkhart, Indiana.

INSPECTORS — Experienced machine inspectors only need apply. Must be trained mechanics and must have actual experience on machine tool inspection. Apply stating age, years of experience and wages expected. Address Box G-117, care *The Iron Age*, 239 W. 39th St., New York.

HELP WANTED

MEN

as

DESIGNERS DRAFTSMEN

on

Complete Steel Plant

Blooming, Structural
Rail and Merchant
Rolling Mills.
Blast Furnaces.
Bessemer Plant.
Open Hearth Furnace.
Ore Crusher, Screens,
Concentrating Plant.
Coke Oven and
By Product Plant.
Power Plant
Electrical Equipment

ADDRESS

ARTHUR G. McKEE & COMPANY
2422 Euclid Avenue
CLEVELAND, OHIO

MANUFACTURERS' AGENTS WANTED to sell punches and dies to bridge, boiler, structural steel, boat, railroad, and car shops; to bed, agricultural implement, and other miscellaneous manufacturers using punch presses in their regular line of work. Address I. P. Richards Co., 23 Pemberton Street, Providence, R. I. Punches and Dies since 1868.

TOOL STEEL SALESMAN for Chicago, Detroit or Cleveland territories. Must have selling experience, one with metallurgical heat treating or machine shop experience preferred. State age, married or single, past and present employers, experience in full; phone number. Address Box E-936, care *The Iron Age*, 239 W. 39th St., New York.

SALESMAN for state of New Jersey—established product. Entire time, permanent; for factories, hardware stores, large earnings—paid in full weekly. This is an exceptional opportunity for right man who means business. Replies confidential—personal interview. Address Box G-42, care *The Iron Age*, 239 W. 39th St., New York.

EMPLOYMENT SERVICE

POSITIONS OPEN

For Executives, Superintendents, Foremen, Engineers, Draftsmen, Metallurgists, and other Technical Men throughout the country. No charge whatever until satisfactorily placed. Write for details. Confidential. Since 1915.

H. H. HARRISON, Inc.
A Superior Personnal Service
20 W. Jackson Blvd. Chicago, Ill.

EMPLOYMENT SERVICE

SALARIED POSITIONS
$2,500 to $25,000

If you are qualified for position between $2,500 and $25,000, and are receptive to negotiations for new connection, your response to this announcement is invited. The undersigned provides a thoroughly organized service, established twenty years ago, to conduct confidential preliminaries and assist the qualified man in locating the particular position he desires. Not a registration bureau. Retaining fee protected by refund provision, as stipulated in our agreement. Send name and address only for description of service. **R. W. Bixby, Inc., 274 Main St., Buffalo, N. Y.**

For ELEVEN (11) YEARS $5,000. to $50,000. men in the metal working industries have retained us to negotiate new connections. INDIVIDUAL. CONFIDENTIAL. Leading businessmen in the metal-working industries know us and believe in us. Not an employment agency. **JACOB PENN, Inc., 11 Park Place, New York City.**

SITUATIONS WANTED

SUPERINTENDENT or PRODUCTION MANAGER. 16 years' experience, diversified production, foundry, machine, steel and kindred departments. Technical and practical training. Approved record of production. Cost reductions through wage incentives and modern methods. Age 35. Twelve years last connection. Go anywhere. Address Box G-88, care *The Iron Age*, 239 W. 39th St., New York.

WORKS, FACTORY MANAGER or SUPERINTENDENT; wide experience covering management of machine shop, tool room, foundry, sheet metal, press shop, etc. Practical and technical training with record of results both on mass production and general engineering work. Address Box G-97, care *The Iron Age*, 239 W. 39th St., New York.

CHEMIST. Graduate, two years' experience in metallurgical analysis. Capable of taking charge of steel mill laboratory. References. Address Box C-973, care *The Iron Age*, 1362 Hanna Bldg., Cleveland, O.

BLAST FURNACE SUPERINTENDENT with several years' successful experience in charge of merchant blast furnaces desires an appointment with representative of a company needing a good man. Address Box G-72, care *The Iron Age*, 239 W. 39th St., New York.

Help Wanted Rates

Set solid, minimum 50 words.....$3.00
Each additional word 6c

All capitals, minimum 50 words.....$4.50
Each additional word 9c

All capitals, leaded, minimum 50 words...$6.00
Each additional word 12c

Situations Wanted Rates

Set solid, minimum 25 words.....$ .75
Each additional word 3c

All capitals, minimum 25 words.....$1.50
Each additional word 6c

All capitals, leaded, minimum 25 words....$2.25
Each additional word 9c

Display Advertising Rates Given on Request

COUNT SEVEN WORDS FOR KEYED ADDRESS

Do not send original letters of recommendation in replying to advertisements—duplicates will answer the purpose. Letters forwarded without charge.

Employment Exchange

SITUATIONS WANTED

PRODUCTION EXECUTIVE—Would like to hear from a firm preferably in the metal stamping industry who would be interested in securing a practical man on production, tooling or experimental engineering. Experience consists of eight years as machinist, toolmaker and five years as tool room foreman and designer for a firm manufacturing light and heavy stampings. At present am employed as a designer on jigs, fixtures, punches and dies. Age 30. Married. Address Box G-126, care *The Iron Age*, 239 W. 39th St., New York.

EXECUTIVE—37, direct contact all phases of management, production economies, cost and expense control, wage incentives and development, layouts and installations, equipment and buildings. Large and small factories, foundry, machine shop, metal and wood specialties. Technical, take charge or act as assistant where ability to plan and direct will lead to permanent relation. Address Box G-65, care *The Iron Age*, 239 W. 39th St., New York.

DROP FORGE SUPERINTENDENT wishes to make a change. Eighteen years' experience in one of the largest shops as foreman and superintendent. Will accept place as foreman. Chance for advancement more desired than large salary to start. Address Box G-112, care *The Iron Age*, 239 W. 39th St., New York, N. Y.

Situation Wanted: PURCHASING AGENT or ASSISTANT EXECUTIVE with broad experience in manufacturing rolling mill, pipe mill and tube mill machinery. Age forty. Highest quality reference as to character and ability. Address Box A-823, care *The Iron Age*, 811 Park Bldg., Pittsburgh, Penna.

A man of wide experience as MACHINE DESIGNER, FOREMAN, SUPERINTENDENT, desires a connection in the capacity of superintendent or mechanical superintendent with medium sized manufacturing concern in the Eastern States. Address Mechanic, Box G-119, care *The Iron Age*, 239 W. 39th St., New York.

SALESMAN, 35, married, experienced in selling Iron, Steel and Castings to Iron and Machine Shops in New York City. Seeks a position with A-1 concern. References furnished. Harry Kaplan, 980 49th St., Brooklyn, N. Y.

SALES ENGINEER—Age 32; ten years' experience selling fabricated steel and castings in New York and Eastern states. Large clientele. Desires connection company manufacturing specialties. Address Box G-120, care *The Iron Age*, 239 W. 39th St., New York.

MANUFACTURING EXECUTIVE AVAILABLE. Thoroughly experienced in sales and production with eighteen year record for producing results. A hustler. Address Box 7372-A, care *The Iron Age*, 1507 Otis Bldg., Chicago, Ill.

MECHANICAL ENGINEER, seven years utility power projects including design, specifications, purchase. Responsible charge. Three years sales. Age thirty-two. Married. Box 372, care *The Iron Age*, 1402 Widener Bldg., Philadelphia, Pa.

WANTED—A MILL by FOREMAN ROLLER, willing to go anywhere and thoroughly capable. Address Box G-29, care *The Iron Age*, 239 W. 39th St., New York.

SITUATIONS WANTED

MANUFACTURING EXECUTIVE—Mechanical Engineer with extensive successful experience in plant management, purchasing, production, cost reduction tools, machinery design, research and improvements. Noteworthy results in building loyal organization and handling of a number of men. Interview desired with manufacturer, wanting the service of an executive having judgment, initiative and imagination with ability to fully co-operate his departments with others. Address Box G-115, care *The Iron Age*, 239 W. 39th St., New York.

DETROIT DISTRICT REPRESENTATIVE, graduate engineer and practical shop man, wants new connection. Two positions in last eighteen years, fifteen years in Detroit. Automotive trade connections, production and equipment lines, experienced in material handling. Salary or commission basis. Address Box G-105, care *The Iron Age*, 239 W. 39th St., New York.

BUSINESS EXECUTIVE desires to connect with manufacturing business where ambition, experience, push and energy are needed. Financial investment might be arranged. New England or New York State preferred. Address Box G-107, care *The Iron Age*, 239 W. 39th St., New York.

INDUSTRIAL PURCHASING AGENT, employed, seeks new affiliation, no objections small city, age 39, married, salary approximately $4,000. Address Box G-75, care *The Iron Age*, 239 W. 39th St., New York.

STEEL FOUNDRY SUPERINTENDENT or Pattern shop executive with 15 years' experience heading and gateing—dry floor—pattern shop. References, Available at once. Address Box G-127, care *The Iron Age*, 239 W. 39th St., New York

SUPERINTENDENT OR ASSISTANT—Cold drawn steel. Eight years' experience. Carbons and alloy steels, Bessemer screw stock. Can furnish A-1 references. Married. Address Box G-122, care *The Iron Age*, 239 W. 39th St., New York.

Position wanted, FOUNDRY or CHEMICAL WORK by college graduate, practical foundryman, experienced in metallurgical work, capable taking charge of chemical laboratory or foundry work. Address Box G-69, care *The Iron Age*, 239 W. 39th St., New York.

SALES ENGINEER, experienced in Sales, Design, Construction and Operation of Wire Mill, Rope and Cable Making Machinery. Address Box G-130, care *The Iron Age*, 239 W. 39th St., New York.

A STRUCTURAL STEEL PLANT GENERAL SUPERINTENDENT is available at once. Not many better men in the country, years of big plant experience. Address Box G-128, care *The Iron Age*, 239 W. 39th St., New York.

SALESMAN OF EXPERIENCE and executive ability located in the Metropolitan District, would represent reputable manufacturer of staple products. Address Box G-114, care *The Iron Age*, 239 W. 39th St., New York.

MAN with ELECTRICAL and MECHANICAL EXPERIENCE wants position as CHIEF. Mine and Mill experience. Address Box G-90, care *The Iron Age*, 239 W. 39th St., New York.

SITUATIONS WANTED

Classified Advertising must produce

RESULTS

That's why the company having equipment for sale uses the Clearing House Section.

Then there is the company who need men—an ad in the Help Wanted Section brings a number of inquiries from which a selection can easily be made.

In addition there are companies wanting representation in the various cities—others who require a new product to manufacture or who want to sell their plants—the Business Opportunities Section makes the contact.

▼

It pays to use.....

THE IRON AGE

Help Wanted Rates

Set solid, minimum 50 words.....$3.00
Each additional word 6c

All capitals, minimum 50 words.....$4.50
Each additional word 9c

All capitals, leaded, minimum 50 words...$6.00
Each additional word 12c

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Products Index

ABRASIVE WHEELS—See Grinding Wheels

ABRASIVES
Pangborn Corp., Hagerstown, Md.

ACCOUNTANTS
Stone, Francis & Hart, 165 Broadway, N. Y. C.

ACCUMULATORS—Hydraulic
Elmes, Chas. F., Engrg. Works, Chicago.
Hydraulic Press Mfg. Co., The, Columbus, Ohio.
Lake Erie Engng. Corp., Buffalo, N. Y.
Southwark Fdry. & Mach. Co., Phila.
Watson-Stillman Co., 71 West St., N.Y.C.
Wood, R. D., & Co., Philadelphia.

ACETYLENE—Dissolved in Cylinders
Air Reduction Sales Co., 342 Madison Ave., N. Y. C.
International Oxygen Co., Newark, N. J.

ACIDS—Pickling
American Chemical Paint Co., Ambler, Pa.

AIR TANKS AND CYLINDERS
Air-Tight Steel Tank Co., Ptgh.
Janney, Joseph A., Jr., Phila.
Scaife, William B., & Sons Co., Ptgh.

ALLOYS—Phosphor Bronze
Phosphor Bronze Smelting Co., Phila.

ALLOYS—Titanium
Titanium Alloy Mfg. Co., Niagara Falls, N. Y.

ALLOYS—Zinc Base Die Casting
New Jersey Zinc Sales Co., Inc., 160 Front St., N. Y. C.

ALUMINUM
Rogers Brown & Crocker Bros., Inc., 31 East 40th St., N. Y. C.

AMMONIA RECOVERY PLANTS
Koppers Construction Co., The, Ptgh.

ANGLES, BEAMS, CHANNELS AND TEES
Bethlehem (Pa.) Steel Company
Blaw-Knox Co., Ptgh.
Carnegie Steel Co., Pittsburgh
Illinois Steel Warehouse Co., Chicago
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Ptgh.
Phoenix Iron Co., Phila.
Republic Iron & Steel Co., Youngstown, O.
Ryerson, Jos. T., & Son, Inc., Chicago
Scullin Steel Co., St. Louis, Mo.

ANNEALING—See Heat Treating

ANODES—Except Gold & Silver
Meaker Co., The, Chicago.

ANVILS
Atkins, E. C., & Co., Indianapolis, Ind.
West Steel Casting Co., The, Cleveland.

APPRAISERS
Standard Appraisal Co., 6 Church St., N. Y. C.

ARBORS
Morse Twist Drill & Mch. Co., New Bedford, Mass.

ARMORING MACHINES—Wire, Cable, Hose, Etc.
Sleeper & Hartley, Inc., Worcester, Mass.

ARRESTERS—Spark
Harrington & King Perforating Co., Chi.

AUCTIONEERS
Industrial Plants Corp., 25 Church, New York, N. Y.
Segal, Herbert Action & Co., 225 Halsey St., Newark, N. J.

AXLES—Car or Locomotive
Bethlehem (Pa.) Steel Company
Carnegie Steel Co., Pittsburgh.

AXLES—Upset Forged
Amer. Forge Co., 2621 So. Hoyne Ave., Chicago.

BABBITT METAL
Ryerson, Jos. T., & Son, Inc., Chicago.

BALING PRESSES—Hydraulic
Galland-Henning Mfg. Co., Milwaukee.
Hydraulic Press Mfg. Co., The, Columbus, Ohio.

BALING PRESSES—Scrap Metal
Galland-Henning Mfg. Co., Milwaukee.

BALLS—Burnishing
Abbott Ball Co., 1047 New Britain Ave., Hartford, Conn.

BALLS—Forged Chrome Steel for Pulverizing
Philadelphia (Pa.) Steel & Iron Co.

BALLS—Steel, Brass or Bronze
Abbott Ball Co., 1047 New Britain Ave., Hartford, Conn.
Auburn Ball Bearing Co., Rochester, N. Y.
New Departure Mfg. Co., Bristol, Ct.

BANDS—Steel
Akron-Selle Co., Akron, Ohio.
Bethlehem (Pa.) Steel Company
Central Alloy Steel Corp., Massillon, O.

BARRELS—Burnishing
Abbott Ball Co., 1047 New Britain Ave., Hartford, Conn.
Baird Machine Co., Bridgeport, Conn.
Globe Mach. & Stpg. Co., Cleveland

BARRELS—Plating
Meaker Co., The, Chicago.

BARRELS—Steel Shop
Cleveland (O.) Wire Spring Co.

BARRELS—Tumbling—See Tumbling Barrels

BARS—Alloy
Central Alloy Steel Corp., Massillon, O.

BARS—Cast Bronze
Buckeye Brass & Mfg. Co., Cleveland.

BARS—Concrete, Reinforcing
Bethlehem (Pa.) Steel Co.
Laclede Steel Co., St. Louis, Mo.
Nicetown Plate Washer Co., Inc., Phila.
Ryerson, Jos. T., & Son, Inc., Chicago.
Scullin Steel Co., St. Louis, Mo.

BARS—Manganese Steel
Manganese Steel Forge Co., Phila.

BARS—Steel
Ames, W. & Co., Jersey City, N. J.
Andrews Steel Co., The, Newport, Ky.
Bethlehem (Pa.) Steel Co.
Carnegie Steel Co., Pittsburgh.
Donner Steel Co., Inc., Buffalo, N. Y.
Illinois Steel Warehouse Co., Chicago.
Inland Steel Co., Chicago.
Interstate Iron & Steel Co., Chicago, Ill.
Philadelphia (Pa.) Steel & Iron Co.
Republic Iron & Steel Co., Youngstown, O.
Ryerson, Jos. T., & Son, Inc., Chicago
Scullin Steel Co., St. Louis, Mo.
Timken Roller Bearing Co., Canton, Ohio.

BASKETS—Pickling
Breese Bros. Co., Cincinnati.

BEAMS—See Angles, Beams, Channels and Tees.

BEARING METAL
Fredericksen Co., Saginaw, Mich.

BEARINGS—Ball
Auburn Ball Bearing Co., Rochester, N. Y.
Bantam Ball Bearing Co., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Matthews Mfg. Co., Worcester, Mass.
New Departure Mfg. Co., Bristol, Ct.
Standard Machinery Co., Auburn, R. I.

BEARINGS—Brass and Bronze
American Manganese Bronze Co., Phila.
Buckeye Brass & Mfg. Co., Cleveland.
Buffalo (N. Y.) Bronze Die Cast Corp.
Erie (Pa.) Bronze Co.
Fredericksen Co., Saginaw, Mich.
Lumen Bearing Co., Buffalo, N. Y.

BEARINGS—Oilless
Rhoades, R. W., Metaline Co., Inc., Long Island City, N. Y.

BEARINGS—Radial
Bantam Ball Bearing Co., South Bend, Ind.

BEARINGS—Roller
Bantam Ball Bearing Co., South Bend, Ind.
Medart Co., The, St. Louis, Mo.
Royersford (Pa.) Fdry. & Mch. Co., Inc.
Standard Machinery Co., Auburn, R. I.
Timken Roller Bearing Co., Canton, Ohio.

BEARINGS—Roller, Tapered
Timken Roller Bearing Co., Canton, Ohio.

BEARINGS—Shaft Hanger
Fafnir Bearing Co., New Britain, Conn.

BEARINGS—Thrust
Bantam Ball Bearing Co., South Bend, Ind.
Matthews Mfg. Co., Worcester, Mass.
Standard Machy. Co., Auburn, R. I.
Timken Roller Bearing Co., Canton, Ohio.

BELT FASTENERS
Smith, F. P., & Co., Sharon Hills, Pa.

BELTING-Chain
Cross Engineering Co., Carbondale, Pa.
Morse Chain Co., Ithaca, N. Y.

BELTING-Conveyor
New York Belting & Packing Co., 91-93 Chambers St., N. Y. C.

BELTING—Leather
Chicago (Ill.) Rawhide Mfg. Co., 1313 Elston Ave.

BELTING—Rubber
New York Belting & Packing Co., 91-93 Chambers St., N. Y. C.

BENCHES AND TABLES—Steel
Standard Pressed Steel Co., Jenkintown, Pa.

BENCHES — Draw—See Wire Drawing Machinery

BENDING MACHINES—Angle or I-Beams
Galland-Henning Mfg. Co., Milwaukee.
Smith, David H., & Sons, Inc., Foot of 51st St., B'klyn, N. Y.
Thomas Spacing Mach. Co., Ptgh.

BENDING MACHINES, BAR—Circle or Spiral
Kardong Bros., Inc., Minneapolis, Minn.

BENDING MACHINES—Hand and Power
American Pipe Bending Mch. Co., Boston.
Cincinnati (O.) Shaper Co., The.
Cleveland (O.) Punch & Shear Wks. Co.
Dreis & Krump Mfg. Co., Chicago.
Kane & Roach, Syracuse, N. Y.
Pels, Henry, & Co., 90 West St., N. Y. C.
Ryerson, Jos. T., & Son, Inc., Chicago.
Yoder Co., The, Cleveland, O.

BENZOL RECOVERY PLANTS
Koppers Construction Co., The, Ptgh.

BILLETS—Alloy Steel
Andrews Steel Co., The, Newport, Ky.
Donner Steel Co., Inc., Buffalo, N. Y.

BILLETS—Carbon Steel
Andrews Steel Co., The, Newport, Ky.

BILLETS—Carbon Vanadium Steel
Andrews Steel Co., The, Newport, Ky.

BILLETS—Chrome Steel
Andrews Steel Co., The, Newport, Ky.

BILLETS—Chrome Nickel Steel
Andrews Steel Co., The, Newport, Ky.

BILLETS—Die Block Steel
Andrews Steel Co., The, Newport, Ky.

BILLETS—Forging
Andrews Steel Co., Newport, Ky.
Central Alloy Steel Corp., Massillon, O.
Heppenstall Co., Pittsburgh.
Ryerson, Jos. T., & Son, Inc., Chicago

BILLETS—Nickel Steel
Andrews Steel Co., The, Newport, Ky.
Bethlehem (Pa.) Steel Co.
Central Alloy Steel Corp., Massillon, O.

BILLETS—Re-rolling
Andrews Steel Co., Newport, Ky.

BILLETS—Steel
Alan Wood Steel Co., Conshohocken, Pa.
Bethlehem (Pa.) Steel Co.
Central Alloy Steel Corp., Massillon, O.
Inland Steel Co., Chicago.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.

BLANKS—Brass and Copper
Bridgeport (Conn.) Brass Co.

BLANKS—Gear & Pinion
Chicago (Ill.) Rawhide Mfg. Co., 1313 Elston Ave.
Edgewater Steel Co., Pittsburgh.

BLANKS—Gear & Pinion, Upset Forged
Amer. Forge Co., 2621 S. Hoyne Ave., Chicago.

BLAST FURNACE SPECIALTIES
Brosius, Edgar E., Inc., Sharpsburg P. O., Ptgh.
Research Corp., 25 West 43rd St., N. Y. C.

BLOCKS—Chain
Yale & Towne Mfg. Co., Stamford, Ct.

BLOCKS—Creosoted
Jennison-Wright Co., Toledo.

BLOCKS—Packing and Stop
Standard Shop Equip. Co., Inc., Phila.

BLOWERS—Pressure
Anthony Co., Long Island City, N. Y.
Buffalo (N. Y.) Forge Co., 493 B'way
Champion Blower & Forge Co., Lancaster Pa.

BLOWERS—Rotary
Roots, P. H. & F. M., Co., Connersville, Ind.

BLOWPIPES—Brazing, Cutting & Welding
Oxweld Acetylene Co., 30 E. 42nd St., N. Y. C.

BOILER HEADS—Flanged and Dished
Bethlehem (Pa.) Steel Co.
Ryerson, Jos. T., & Son, Inc., Chicago.

BOILERS—Return Tubular
Muskegon (Mich.) Boiler Wks.

BOILERS—Waste Heat
Babcock & Wilcox Co., The, 85 Liberty St., N.Y.C.

BOILERS—Water Tube
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.

BOLT CUTTERS
Acme Mchry. Co., Cleveland, O.
National Mchry. Co., Tiffin, Ohio.

BOLT AND NUT MACHINERY
Acme Machinery Co., Cleve.
Economy Engng. Co., The, Willoughby, O.
Manville, E. J., Mach. Co., Waterbury, Ct.
National Mchry. Co., Tiffin, Ohio.
Waterbury (Ct.) Farrel Fdry. & Mch. Co.

BOLT & RIVET CLIPPERS
Helwig Mfg. Co., St. Paul, Minn.

BOLTS—Carriage & Machine.
Buffalo Bolt Co., N. Tonawanda, N. Y.
Lamson & Sessions Co., The, Cleveland, O.
Milton (Pa.) Mfg. Co.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

BOLTS—Machine Tool Table
Standard Shop Equip. Co., Inc., Phila.

BOLTS—Slot
Standard Shop Equip. Co., Inc., Phila.

BOLTS—Special
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

BOLTS—Special, Hot or Cold Upset
Lamson & Sessions Co., The, Cleveland, O.

BOLTS—Stove
Lamson & Sessions Co., The, Cleveland, O.

BOLTS—Track
Inland Steel Co., Chicago.

BOLTS AND NUTS
Ames, W., & Co., Jersey City, N. J.
Bell, David, Co., Inc., The, Buffalo, N. Y.
Bethlehem (Pa.) Steel Co.
Buffalo Bolt Co., N. Tonawanda, N. Y.
Clark Bros. Bolt Co., Milldale, Conn.
Merrill Bros., Maspeth, N. Y.
Milton (Pa.) Mfg. Co.
Neely Nut & Bolt Co., Ptgh.
Oliver Iron & Steel Corp., Ptgh.
Reed & Prince Mfg. Co., Worcester, Mass.
Rhode Island Tool Co., Providence, R. I.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Jos. T., & Son, Inc., Chicago.
Wrought Iron Company of America, Lebanon, Pa.

BORING, DRILLING AND MILLING MACHINES—Horizontal
Barnes, W. F., & John Co., Rockford, Ill.
Defiance (O.) Mch. Wks.
Hill, Clarke & Co. of Chicago, 647 W Washington Blvd., Chicago, Ill.
Lucas Machine Tool Co., Cleve.
Ryerson, Jos. T., & Son, Inc., Chicago.
Sellers, William, & Co., Inc., Phila.
Universal Boring Mch. Co., Hudson, Mass.

BORING & DRILLING MACHINES—Vertical
Baker Bros., Inc., Toledo.
Bullard Co., The, Bridgeport, Ct.
Consolidated Mch. Tool Corp. of America, Rochester, N. Y.

BORING BARS
Bullard Co., The, Bridgeport, Ct.

BORING MACHINES—Cylinder
Baker Bros., Inc., Toledo.

BORING AND TURNING MILLS—Vertical
Bullard Co., The, Bridgeport, Ct.
Cincinnati (O.) Planer Co., The.
Sellers, William, & Co., Inc., Phila.

BOXES—Annealing
Blaw-Knox Co., Ptgh.
Petroleum Iron Wks. Co., Sharon, Pa.
Union Steel Casting Co., Pittsburgh

BOXES—Steel
Cleveland (O.) Wire Spring Co.

BRAKES—Electric
Clark Controller Co., The, Cleveland, O.

BRAKES—Metal Forming
Cincinnati (O.) Shaper Co., The
Dreis & Krump Mfg. Co., Chicago.
Minster (O.) Machine Co.
Ohl, Geo. A., & Co., Inc., Newark, N. J.

BREECHINGS
Muskegon (Mich.) Boiler Works

BRICK—Chrome
General Refractories Co., Phila.
Harbison-Walker Refractories Co., Pgh.
Lavino, E. J., & Co., Phila.

ALL THESE COMPANIES CARRY AN AD IN THIS ISSUE
ALPHABETICAL INDEX . . . . PAGES 240-242

BRICK—Fire Clay
Carborundum Co., The, Niagara Falls, N. Y.
General Refractories Co., Phila.
Harbison-Walker Refractories Co., Ptgh.
North American Refractories Co., Cleveland, Ohio.
Stowe-Fuller Refractories Co., The, Cleve.
U. S. Refractories Corp., Mt. Union, Pa

BRICK—Magnesite
General Refractories Co., Phila.
Harbison-Walker Refractories Co., Ptgh.
Lavino, E. J., & Co., Phila.

BRICK—Silica
General Refractories Co., Phila.
Harbison-Walker Refractories Co., Ptgh.
Lavino, E. J., & Co., Phila., Pa.
U. S. Refractories Corp., Mt. Union, Pa.

BRIDGE BUILDERS
McClintic-Marshall Co., Ptgh.
Phoenix Iron Co., Phila.
Shoemaker Bridge Co., Pottstown, Pa.

BRIDGE OPERATING MACHINERY—Movable
Earle Gear & Mch. Co., Phila.

BROACHES
Amer. Broach & Mch. Co., Ann Arbor, Mich
Lapointe Mch. Tool Co., Hudson, Mass.

BROACHING MACHINES
Amer. Broach & Mch. Co., Ann Arbor, Mich.
Lapointe Mch. Tool Co., Hudson, Mass.

BRONZE—Phosphor
Phosphor Bronze Smelting Co., Phila.

BRONZE BAR—Cored & Solid
Fredericksen Co., Saginaw, Mich.

BUCKETS—Clamshell
Blaw-Knox Co., Pittsburgh.
Brosius, Edgar E., Inc., Sharpsburg P. O., Ptgh.
Browning Crane Co., The, Cleveland.
Hayward Co., 50 Church St., N. Y. C.
Industrial Brownhoist Corp., Cleveland.
Orton Crane & Shovel Co., Chicago.
Owen Bucket Co., Cleveland.

BUCKETS—Dragline
Harnischfeger Corp., Milwaukee.

BUCKETS—Electric Motor
Hayward Co., 50 Church St., N. Y. C.

BUCKETS—Elevator
Hendrick Mfg. Co., Carbondale, Pa.

BUCKETS—Orange Peel
Hayward Co., 50 Church St., N. Y. C.

BUCKETS—Single Line
Milwaukee (Wis.) Elec. Crane & Hoist Corp.

BUCKLES—Bale, Tie
Joliet (Ill.) Wrought Washer Co.

BUFFS
Divine Brothers Co., Utica, N. Y.

BUILDINGS—Factory
Austin Co., The, Cleveland
Blaw-Knox Co., Ptgh.

BUILDINGS—Steel
Austin Co., The, Cleveland.
Belmont Iron Works, Phila.
Blaw-Knox Co., Ptgh.
McClintic-Marshall Co., Ptgh.

BULLDOZERS
Beatty Mch. & Mfg. Co., Hammond, Ind.

BUNDLERS—Scrap (Wire)
Vaughn Mchry. Co., Cuyahoga Falls, O.

BUNKERS—Coal
Muskegon (Mich.) Boiler Works

BURNERS—Oil or Gas
Anthony Co., The L. I. City, N. Y.
Best, W. N., Corp., 295 5th Ave., N. Y. C.
Economy Furnace Co., Chicopee, Mass.
Hauck Mfg. Co., 128 Tenth St., Bklyn., N. Y.

BURRS—Steel
Wrought Washer Mfg. Co., Milwaukee.

BUSHINGS—Brass and Bronze
Buckeye Brass & Mfg. Co., Cleveland.
Erie (Pa.) Bronze Co.
Fredericksen Co., Saginaw, Mich.
Harsch, John, Bronze & Fdry. Co., The, Cleveland, Ohio
Shenango-Penn Mold Co., Pittsburgh.

BUSHINGS—Oilless
Rhoades, R. W., Metaline Co., Inc., Long Island City, N. Y.

BUSHINGS—Phosphor Bronze
American Manganese Bronze Co., Phila
Phosphor Bronze Smelting Co., Phila.

BY-PRODUCTS COKE & GAS OVENS
Koppers Construction Co., The, Ptgh.

CABLEWAYS AND TRAMWAYS—See Tramways

CABINETS—Steel
Angle Steel Stool Co., Plainwell, Mich.

CARBIDE
Air Reduction Sales Co., 342 Madison Ave., N. Y. C.

CARBURIZING—See Heat Treating

CARS—Dump
Atlas Car & Mfg. Co., Cleveland

CARS—Industrial and Mining
Atlas Car & Mfg. Co., Cleve.
Chase Fdry. & Mfg. Co., Columbus, O.

CASE HARDENING—See Heat Treating

CASTINGS—Acid or Heat Resisting
American Manganese Bronze Co., Phila.
Harsch, John, Bronze & Fdry. Co., The, Cleveland, Ohio.
Hoskins Mfg. Co., Detroit
National Alloy Steel Co., Blawnox, Pa.
West Steel Casting Co., The, Cleveland.

CASTINGS—Alloy Steel
Babcock & Wilcox Tube Co., The, 85 Liberty St., N. Y. C.
National Alloy Steel Co., Blawnox, Pa.
West Steel Casting Co., The, Cleveland.

CASTINGS—Aluminum
Harsch, John, Bronze & Fdry. Co., The, Cleveland, Ohio.

CASTINGS—Brass, Bronze, Copper or Aluminum
American Manganese Bronze Co., Phila.
Atlas Brass Fdry. Co., Columbus, Ohio.
Bethlehem (Pa.) Steel Co.
Buffalo (N. Y.) Bronze Die Cast Corp.
Cadman, A. W., Mfg. Co., Ptgh.
Erie (Pa.) Bronze Co.
Harsch, John, Bronze & Fdry. Co., The, Cleveland, Ohio.
Lumen Bearing Co., Buffalo, N. Y.
Phosphor Bronze Smelting Co., Phila.
Spencer's, I. S., Sons, Inc., Guilford, Ct.
Turner & Seymour Mfg. Co., Torrington Ct.
York (Pa.) Fdry. & Mch. Co.

CASTINGS—Die
Buffalo (N. Y.) Bronze Die Cast Corp.

CASTINGS—Electric Steel
American Steel Foundries, Chicago.
Commercial Steel Casting Co., Marion, O.
Crucible Steel Casting Co., Cleve.
Farrell-Cheek Steel Foundry Company, Sandusky, Ohio.
Industrial Steel Casting Co., The, Toledo.
Maynard Elec. Steel Casting Co., Milw.
Sivyer Steel Casting Co., Milwaukee.
Smith, Geo. H., Steel Casting Co., Milw.
Treadwell Engineering Co., Easton, Pa.
West Steel Casting Co., The, Cleveland.

CASTINGS—Gray Iron
Bethlehem (Pa.) Steel Co.
Connecticut Fdry. Co., The, Rocky Hill, Ct.
Colebrookdale Iron Co., Pottstown, Pa.
Excelsior Tool & Mch. Co., E. St. Louis, Ill.
Eyster, Weiser Co., York, Pa.
Forest City-Walworth Run Fdries. Co., Cleve.
Hardie-Tynes Mfg. Co., Birmingham, Ala.
Hill Clutch Machine & Foundry Co., Cleveland, O.
Hyde Park (Pa.) Fdry. & Mach. Co.
Kline Hardware Co., Allentown, Pa.
Moloch Fdry. & Mch. Co., Kaukauna, Wis.
National Roll & Fdry. Co., Avonmore, Pa.
Newark (N. J.) Malleable Iron Wks.,
North Wales (Pa.) Mach. Co., Inc.
Nute, McGehee, Geary Co., Inc., Chambersburg, Pa.
Penn Foundry & Mfg. Co., Box 182, Reading, Pa.
Poole Engng. & Mch. Co., Balto., Md.
Royersford (Pa.) Fdry. & Mch. Co., Inc.
Sessions Foundry Co., The, Bristol, Ct.
Sharples Separator Co., West Chester, Pa.
Spencer's, I. S., Sons, Inc., Guilford, Ct.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
Toledo (O.) Mch. & Tool Co.
Xenia (Ohio) Fdry. & Mch. Co.
York (Pa.) Fdry. & Mch. Co.

CASTINGS—Malleable
Fort Pitt Malleable Iron Co., Ptgh.
Link-Belt Co., Indianapolis, Ind.
Malleable Iron Fittings Co., Branford, Ct.
Meeker Foundry Co., Newark, N. J.
Newark (N. J.) Malleable Iron Wks.,
Northern Mal. Iron Co., St. Paul, Minn.
Peoria (Ill.) Malleable Castings Co.
Philadelphia (Pa.) Hardware & Malleable Iron Wks., Inc.
Pratt, William E., Mfg. Co., Chicago.
Richmond (Ind.) Malleable Castings Co.
Timken Roller Bearing Co., Canton, Ohio.
Vermilion Mal. Iron Co., Hoopeston, Ill.

CASTINGS—Manganese Steel
Frog, Switch & Mfg. Co., The, Carlisle, Pa.

CASTINGS—Semi-Steel
Malleable Iron Fittings Co., Branford, Ct.

CASTINGS—Steel
Allegheny Steel Co., Brackenridge, Pa.
American Steel Foundries, Chicago.
Atlas Steel Casting Co., Buffalo, N. Y.
Bethlehem (Pa.) Steel Company
Birdsboro (Pa.) Steel Fdry. & Mch. Co.
Cann & Saul Steel Co., Phila.
Cincinnati (O.) Steel Castings Co.
Commercial Steel Casting Co., Marion, O.
Crucible Steel Casting Co., Cleveland.
Crucible Steel Castings Co., Lansdowne, Pa.
Duquesne Steel Fdry. Co., Pittsburgh, Pa.
Erie (Pa.) Forge Co.
Farrell-Cheek Steel Fdry. Co., Sandusky, Ohio.
Industrial Steel Casting Co., The, Toledo.
Malleable Iron Fittings Co., Branford, Ct.
Maynard Elec. Steel Castings Co., Milw.
Scullin Steel Co., St. Louis, Mo.
Sivyer Steel Casting Co., Milwaukee.
Smith, Geo. H., Steel Casting Co., Milw.
Strong Steel Foundry Co., Buffalo, N. Y.
Union Steel Casting Co., Pittsburgh.
Union Switch & Signal Co., Swissvale, Pa.
West Steel Casting Co., The, Cleveland.

CEMENT—Refractory
Carborundum Co., The, Perth Amboy, N. J.
Harbison-Walker Refractories Co., Ptgh.

CEMENT—Silica and Chrome
General Refractories Co., Phila.
Harbison-Walker Refractories Co., Ptgh.

CEMENT ROOFING TILE
American Cement Tile Mfg. Co., 803 Oliver Bldg., Ptgh.
Federal Cement Tile Co., Chicago.

CENTERING MACHINES
Whiton, D. E., Mach. Co., New London, Ct.

CENTERS—Index
Simmons Mch. Tool Corp., Albany, N. Y.

CHAINS—Conveyor and Elevator
Jones & Laughlin Steel Corp., Ptgh.
Link-Belt Co., Chicago.

CHAINS—Dredge
Carroll Chain Co., Columbus, Ohio.

CHAINS—Power Transmission
Boston Gear Works Sales Co., Norfolk Downs, Mass.
Link-Belt Co., Chicago.
Morse Chain Co., Ithaca, N. Y.
Whitney Mfg. Co., Hartford, Conn.

CHAINS—Rocker Joint
Morse Chain Co., Ithaca, N. Y.

CHAINS—Sling
Carroll Chain Co., Columbus, Ohio.

CHAIRS—Adjustable
Vitek Mfg. Co., Omaha, Neb.

CHANNELS—See Angles, Beams, Channels and Tees

CHAPLETS
Erdle Perforating Co., Rochester, N. Y.

CHARCOAL—(Briquets)
Ford Motor Co., Detroit, Mich.

CHARGING MACHINES—Cupola
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., Harvey, Ill.

CHARGING MACHINES—Manipulators
Alliance (Ohio) Mch. Co.

CHECKS—Metal
Noble & Westbrook Mfg. Co., Hartford, Conn.

CHROMIUM-PLATING—See Plating—Chromium

CHUCKING MACHINES—Automatic
Baird Mch. Co., Bridgeport, Ct.

CHUCKING MACHINES — Multiple Spindle
Baird Mch. Co., Bridgeport, Ct.
National Acme Co., The, Cleve.

CHUCKS—Air Operated
Logansport (Ind.) Mch. Co.

CHUCKS—Drill
Cleveland (O.) Twist Drill Co.
Morse Twist Drill & Mch. Co., New Bedford, Mass.

CHUCKS—Lathe
Hoggson & Pettis Mfg. Co., New Haven, Ct.
Whiton, D. E., Mch. Co., New London, Ct.

CIRCLES—Phosphor Bronze
Phosphor Bronze Smelting Co., Phila

CLAMPS—Drop Forged
Williams, J. H., & Co., Buffalo, N. Y.

CLEANERS—Metal
American Chemical Paint Co., Ambler, Pa.
Ford, J. B., Co., Wyandotte, Mich.
Meaker Co., The, Chicago.
Oakite Prod., Inc., 22 Thames St., N.Y.C.

CLUTCHES—Friction
Caldwell, W. E., Co., 260 Brandeis Street Louisville, Ky.
Falls Clutch & Mchry. Co., The, Cuyahoga Falls, Ohio.
Hilliard Corp., The, Elmira, N. Y.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.
Medart Co., The, St. Louis, Mo.
Twin Disc Clutch Co., Racine, Wis.

CLUTCHES—Magnetic
Magnetic Mfg. Co., Milwaukee.

COAL
Cleveland (O.) Cliffs Iron Co.
Hanna Furnace Co., The, Cleveland.
Pickands, Mather & Co., Cleveland, Ohio.
Rogers Brown & Crocker Bros., Inc., 21 E. 40th St., N. Y. C.

COAL, ORE AND ASH HANDLING MACHINERY
Alliance (O.) Machine Co.
Bartlett, C. O. & Snow Co., Cleve.
Hayward Co., The, 50 Church St., N.Y.C.
Industrial Brownhoist Corp., Cleveland.
Link-Belt Co., Chicago.

COILING MACHINES—Metallic, Hose, Speedometer, Casing, Resistance Coils, Wire Spirals, Etc.
Sleeper & Hartley, Inc., Worcester, Mass.

COKE—Metallurgical
Bethlehem (Pa.) Steel Co.
Cleveland (O.) Cliffs Iron Co.
Hillman Coal & Coke Co., Ptgh.
Rogers Brown & Crocker Bros., Inc., 21 E. 40th St., N. Y. C.
Walter-Wallingford & Co., Cincinnati

COKE OVEN MACHINERY
Alliance (O.) Machine Co.
Atlas Car & Mfg. Co., Cleve.
Koppers Construction Co., The, Ptgh.

COKE OVENS—By-Products
Koppers Construction Co., The, Ptgh.

COKE OVENS—Cross Regenerators
Koppers Construction Co., The, Ptgh.

COKE OVENS—With Recovery of By-Products
Koppers Construction Co., The, Ptgh.

COLLETS
Rivett Lathe & Grinder Corp., Boston.

COMPRESSORS—Air
Allis-Chalmers Mfg. Co., Milwaukee.
Bury Compressor Co., Erie, Pa.
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
De Laval Steam Turbine Co., Trenton, N. J.
Ingersoll-Rand Co., 11 B'way, N. Y. C.
Penna Pump & Compressor Co., Easton, Pa.
Sullivan Mchry. Co., Chicago.
Westinghouse Traction Brake Co., Wilmerding, Pa.

COMPRESSORS—Gas
Bury Compressor Co., Erie, Pa.
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
Penna Pump & Compressor Co., Easton, Pa.

CONCRETE CONSTRUCTION
Austin Co., The, Cleveland.

CONCRETE MACHINERY
Ransohoff, N., Inc., Cinn., Ohio.

CONCRETE ROOFING TILE
American Cement Tile Mfg. Co., 803 Oliver Bldg., Ptgh.
Federal Cement Tile Co., Chicago.

CONDENSERS—Surface and Jet
Ingersoll-Rand Co., 11 B'way, N. Y. C.

CONDUCTOR PIPE
Newport (Ky.) Rolling Mill Co.

CONNECTING RODS
Bay City Forge Co., Erie, Pa.

CONTRACTORS—General
Austin Co., The, Cleveland.

CONTRACTORS' SUPPLIES — Second-Hand
Albert & Davidson Pipe Corp., 2nd Ave., 50-51st St., Bklyn., N. Y.
Albert Pipe Supply Co., Inc., Berry & N. 13th St., Bklyn., N. Y.

CONTROLLERS—Electric Motor
Clark Controller Co., The, Cleveland, O.
Electric Controller & Mfg. Co., Cleve.
Square D Co., Detroit.

CONTROLLERS—Temperature
Bristol Co., Waterbury, Ct.
Taylor Instrument Companies, Rochester, N. Y.
Wilson-Maeulen Co., Inc., 738 E. 143rd St., N. Y. C.

CONVERTERS—Steel, Side Blow
Whiting Corp., Harvey, Ill.

CONVEYING AND ELEVATING MACHINERY
Bartlett, C. O. & Snow Co., Cleve.
Industrial Brownhoist Corp., Cleveland.
Link-Belt Co., Chicago.
Portable Machinery Co., Clifton, N. J.
Webb, Jervis B., Co., Detroit, Mich.

CONVEYORS—Portable
Portable Machinery Co., Clifton, N. J.
Webb, Jervis B., Co., Detroit, Mich.

COOLING DEVICES—Furnace
Blaw-Knox Co., Ptgh.

COPING MACHINES
Cleveland (O.) Punch & Shear Wks. Co.
Pels, Henry, & Co., 90 West St., N. Y. C.

CORE MAKING MACHINES
Amer. Fdry. Equip Co., Mishawaka, Ind.

CORUNDUM WHEELS—See Grinding Wheels

COTTERS AND KEYS—Spring
Hindley Mfg. Co., Valley Falls, R. I.
Hubbard, M. D., Spring Co., Pontiac, Mich.
Smith, F. P., & Co., Sharon Hills, Pa.
Western Wire Products Co., St. Louis.

ALL THESE COMPANIES CARRY AN AD IN THIS ISSUE
ALPHABETICAL INDEX . . . . PAGES 240-242

COUNTERBORES
Cleveland (O.) Twist Drill Co.
Morse Twist Drill & Mch. Co., New Bedford, Mass.

COUNTERS—Production
Veeder-Root, Inc., Hartford, Ct.

COUNTING MACHINES
Veeder-Root, Inc., Hartford, Ct.

COUPLINGS—Air Hose
Cleveland (O.) Pneumatic Tool Co., The

COUPLINGS—Cut-off, Friction
Hilliard Corp., The, Elmira, N. Y.

COUPLINGS—Flexible
Ajax Flexible Coupling Co., Westfield, N. Y.
Boston Gear Works Sales Co., Norfolk Downs, Mass.
Clark Controller Co., The, Cleveland, O.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Poole Engng. & Mch. Co., Balto., Md.

COUPLINGS—Friction Clutch
Caldwell, W. E., Co., 260 Brandeis St., Louisville, Ky.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.

COUPLINGS—Shaft
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.
Tomkins-Johnson Co., Jackson, Mich.

CRANES—Crawling Tractor
Browning Crane Co., The, Cleveland.
Conco Crane & Eng. Wks. Div. of H. D. Conkey & Co., 36 S. Jefferson St., Mendota, Ill.
Harnischfeger Corp., Milwaukee.
Link-Belt Co., Chicago.
Orton Crane & Shovel Co., Chicago.

CRANES—Creeper
Industrial Brownhoist Corp., Cleveland.

CRANES—Electric, Industrial Truck Mounted
Crescent Truck Co., Lebanon, Pa.

CRANES—Electric Traveling
Alliance (O.) Machine Co.
American Crane Co., Inc., The, Friendship, N. Y.
Bedford (Ind.) Foundry & Machine Co.
Box Crane & Hoist Corp., Phila.
Cleveland Crane & Engng. Co., Wickliffe, O.
Conco Crane & Eng. Wks. Div. of H. D. Conkey & Co., 36 S. Jefferson St., Mendota, Ill.
Euclid (O.) Crane & Hoist Co.
Harnischfeger Corp., Milwaukee.
Manning, Maxwell & Moore, Inc. (Shaw Crane Wks.), 100 E. 42nd St., N.Y.C.
Maris Brothers, Inc., Phila.
Milwaukee (Wis.) Elec. Crane & Hoist Corp.
Morgan Engineering Co., Alliance, O.
Northern Engng. Wks., 212 Chene St., Detroit.
Payne, N. B., & Co., 25 Church St., N.Y.C.
Robbins & Myers, Inc., Springfield, Ohio.
Roeper Crane & Hoist Wks., Inc., Reading, Pa.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y
Whiting Corp., Harvey, Ill.
Yale & Towne Mfg. Co., Stamford, Ct.

CRANES—Gantry
American Crane Co., Inc., The, Friendship, N. Y.
Cleveland Crane & Engng. Co., Wickliffe, O.
Morgan Engineering Co., Alliance, O.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., Harvey, Ill.

CRANES—Hand Power
Armington Engineering Co., Euclid, O.
Bedford (Ind.) Foundry & Machine Co.
Box Crane & Hoist Corp., Phila.
Cleveland Crane & Engng. Co., Wickliffe, O.
Maris Brothers, Inc., Phila.
Milwaukee (Wis.) Elec. Crane & Hoist Corp.
Payne, N. B., & Co., 25 Church St., N.Y.C.
Whiting Corp., Harvey, Ill.

CRANES—Jib
Box Crane & Hoist Corp., Phila.
Northern Engng. Wks., 212 Chene St., Detroit.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., Harvey, Ill.
Yale & Towne Mfg. Co., Stamford, Ct.

CRANES—Locomotive
Browning Crane Co., The, Cleveland.
Harnischfeger Corp., Milwaukee.
Industrial Brownhoist Corp., Cleveland.
King, Philip T., 50 Church St., N. Y. C.
Link-Belt Co., Chicago.
Manning, Maxwell & Moore, Inc. (Shaw Crane Wks.), 100 E. 42nd St., N.Y.C.
Ohio Locomotive Crane Co., Bucyrus, O.
Orton Crane & Shovel Co., Chicago.

CRANES—Monorail
American MonoRail Co., The, Cleveland.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

CRANES—Motor Truck
Browning Crane Co., The, Cleveland.

CRANES—Pillar & Bracket
Whiting Corp., Harvey, Ill.

CRANES—Portable
Canton (O.) Fdry. & Machine Co.

CRANES—Portable, Electric
Automatic Transportation Co., Inc., Buffalo, N. Y.

CRANES—Wall
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

CRANK SHAFTS
Bay City Forge Co., Erie, Pa.
Union Switch & Signal Co., Swissvale, Pa.

CRIMPING MACHINES
Quickwerk Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Stroine Tool & Mfg. Co., New Bremen, O.

CRUCIBLES—Metallurgical
McCullough-Dalzell Crucible Co., Pgh.
Ross-Tacony Crucible Co., Phila.

CRUSHERS—Coal
American Pulverizer Co., St. Louis, Mo.
Bartlett, C. O. & Snow Co., Cleve.

CRUSHERS—Steel Turning
American Crusher & Machinery Corp., 853 B'dway, N. Y. C.
American Pulverizer Co., St. Louis, Mo.

CRUSHERS—Stone
Morgan Engineering Co., Alliance, O.

CULVERTS
Newport (Ky.) Rolling Mill Co.

CUPOLAS—Foundry
Northern Engng. Wks., 212 Chene St., Detroit.
Whiting Corp., Harvey, Ill.

CUTTERS—Milling
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Prov., R. I.
Cleveland (O.) Twist Drill Co.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.

CUTTING COMPOUNDS
Oakite Prod., Inc., 22 Thames St., N.Y.C.

CUTTING OFF MACHINES—Cold Saw
Espen-Lucas Mch. Wks., Philadelphia.
Hurlbut Rogers Mchry. Co., The, Nashua, N. H.

CUTTING-OFF MACHINES — Pipe or Tubing
Bardons & Oliver, Cleve.
Bignall & Keeler Mach. Work, Edwardsville, Ill.
Etna Machine Co., The, Toledo, O.
Hurlbut Rogers Mchry. Co., The, Nashua, N. H.

CUTTING AND WELDING APPARATUS—Oxy-Acetylene—See Welding and Cutting Machines and Equipment—Oxy-Acetylene

CYLINDERS—Compressed Air, Gas, Etc.
National Tube Co., Pittsburgh.

CYLINDERS—Seamless
National Tube Co., Pittsburgh.

DERRICKS
American-Terry-Derrick Co., South Kearney, N. J.
Hayward Co., The, 50 Church St., N. Y. C.
Mallory Machry. Corp., Baltimore.

DESKS—Steel (Factory)
Angle Steel Stool Co., Plainwell, Mich.

DIAMOND TOOLS
Dickinson, Thos. L., 34 Gold St., N. Y. C.

DIE BLOCKS
Bethlehem (Pa.) Steel Co.
Heppenstall Co., Pittsburgh.
Wetherell Bros. Co., Cambridge, 39, Mass.

DIE SINKING MACHINES—Automatic
Keller Mechanical Engng. Corp., 78 Washington St., Brooklyn, N. Y.

DIES—Embossing and Stamping
Hoggson & Pettis Mfg. Co., New Haven, Ct.
Schwerdtle Stamp Co., Bridgeport, Ct.

DIES—Gripping and Heading
Marchant, Geo. F., Co., Chicago.

DIES—Pipe Threading
Bignall & Keeler Mch. Wks., Edwardsville, Ill.
Curtis & Curtis Co., Bridgeport, Ct.
Murchey Mch. & Tool Co., 951 Porter St., Detroit.

DIES—Screw and Thread Cutting
Curtis & Curtis Co., Bridgeport, Ct.
Eastern Mach. Screw Corp., New Haven, Ct.
Jones & Lamson Mch. Co., Springfield, Vt.
Murchey Mch. & Tool Co., 951 Porter St., Detroit.
National Acme Co., The, Cleve.

DIES—Self-Opening Adjustable
Consolidated Mch. Tool Corp. of America, Rochester, N. Y.
Eastern Mach. Screw Corp., New Haven, Ct.
Geometric Tool Co., New Haven, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
Murchey Mach. & Tool Co., 951 Porter St., Detroit.
National Acme Co., The, Cleve.

DIES—Sheet Metal Working
Adrianee Machine Wks., Inc., 82 Richards St., Bkyn., N. Y.
Beatty Mch. & Mfg. Co., Hammond, Ind.
Bliss, E. W., Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Cleveland (O.) Punch & Shear Wks. Co.
Ferracute Machine Co., Bridgeton, N. J.
New England Pressed Steel Co., 1 Washington Ave., Natick, Mass.
Niagara Mch. & Tool Wks., Buffalo, N. Y.
Richards, I. P., Co., Providence, R. I.
Toledo (O.) Mach. & Tool Co.
Worcester (Mass.) Stamped Metal Co.
Zeh & Hahnemann Co., Newark, N. J.

DIES—Steel Letters and Stamps
Noble & Westbrook Mfg. Co., Hartford, Ct.

DISCS—Abrasive
Gardner Machine Co., Beloit, Wis.

DOLOMITE
Baker, J. E., Co., York, Pa.

DOLOMITE BACK WALL MACHINES
Blaw-Knox Co., Pgh.

DRAWBENCHES
Aetna-Standard Eng. Co., Youngstown, O.

DRAWN WORK—Metal—See Stampings or Drawings—Metal

DRILL HEADS—Multiple
Baker Bros., Inc., Toledo, O.

DRILLING MACHINES—Automatic
Barnes Drill Co., Inc., Rockford, Ill.

DRILLING MACHINES—Bench
Avey Drilling Mch. Co., Cincinnati, O.
Kingsbury Mch. Tool Corp., Keene, N. H.
Leland-Gifford Co., Worcester, Mass.

DRILLING MACHINES—Heavy Duty
Baker Bros., Inc., Toledo, O.
Barnes Drill Co., Inc., Rockford, Ill.

DRILLING MACHINES—Horizontal
Baker Bros., Inc., Toledo, O.
Barnes, W. F. & John, Co., Rockford, Ill.
Kingsbury Mch. Tool Corp., Keene, N. H.
Langelier Mfg. Co., Providence, R. I.

DRILLING MACHINES—Multiple Spindle
Baker Bros., Inc., Toledo, O.
Barnes Drill Co., Inc., Rockford, Ill.
Defiance (O.) Machine Works
Langelier Mfg. Co., Providence, R. I.
Thomas Spacing Mch. Co., Pgh., Pa.

DRILLING MACHINES—Multiple Spindle Vertical
Avey Drilling Mch. Co., Cincinnati, O.

DRILLING MACHINES—Portable Electric
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C
Cincinnati (Ohio) Electrical Tool Co.
Independent Pneumatic Tool Co., Chicago.
Marschke Mfg. Co., Towson, Md.
Standard Electrical Tool Co., The, Cinci.

DRILLING MACHINES—Portable Pneumatic
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
Cleveland (O.) Pneumatic Tool Co., The.
Helwig Mfg. Co., St. Paul, Minn.
Independent Pneumatic Tool Co., Chicago.

DRILLING MACHINES—Radial
American Tool Works Co., Cinci.
Cincinnati (O.) Bickford Tool Co.
Cleveland (O.) Punch & Shear Wks. Co.
Harrington Co., The, Phila.
Ryerson, Jos. T., & Son, Inc., Chicago.
Thomas Spacing Mch. Co., Pgh., Pa.

DRILLING MACHINES—Rock
Ingersoll-Rand Co., 11 B'way, N. Y. C

DRILLING MACHINES—Sensitive
Avey Drilling Mch. Co., Cincinnati, O.
Langelier Mfg. Co., Providence, R. I.
Leland-Gifford Co., Worcester, Mass.
Taylor & Fenn Co., Hartford, Ct.

DRILLING MACHINES—Vertical
Baker Bros., Inc., Toledo, O.
Barnes Drill Co., Inc., Rockford, Ill.
Barnes, W. F. & John Co., Rockford, Ill.
Buffalo (N. Y.) Forge Co., 492 B'way
Champion Blower & Forge Co., Lancaster, Pa.
Cincinnati (O.) Bickford Tool Co.
Defiance (O.) Machine Works
Harrington Co., The, Philadelphia.
Ryerson, Jos. T., & Son, Inc., Chicago.

DROP FORGINGS—See Forgings—Drop, Iron or Steel

DROP HAMMERS—See Hammers—Drop

DROP PRESSES—See Presses—Drop

DROP PIT TABLES
Whiting Corp., Harvey, Ill.

DRYERS FOR ALL MATERIAL
Bartlett, C. O. & Snow Co., Cleve.
Drying Systems, Inc., Chicago, Ill.
Duff Patents Co., Inc., Pgh.

DUST COLLECTORS
Amer. Fdry. Equip. Co., Mishawaka, Ind.
Pangborn Corporation, Hagerstown, Md.
Research Corp., 25 West 43rd St., N. Y. C.
Sly, W. W., Mfg. Co., Cleveland, O.
Whiting Corp., Harvey, Ill.

EAVE TROUGH—See Gutters

ELECTRIC WELDING—See Welding—Electric

ELECTRIC LIGHTING
General Electric Vapor Lamp Co., Hoboken, N. J.

ELECTRICAL MACHINERY — Second Hand
Land, L. J., 207 Centre St., N. Y. C.
Sachsenmaier, Geo., Co., Phila., Pa.

ELEVATORS—Portable
Lewis-Shepard Co., 122 Walnut St., Watertown Station, Boston.

EMERY WHEELS—See Grinding Wheels

ENAMELING
Geuder, Paeschke & Frey Co. (Contract Mfg. Div.), Milwaukee.

ENAMELING MCHS.—Magnetic Wire
Sleeper & Hartley, Inc., Worcester, Mass.

ENGINEERS—Consulting
Brassert, H. A., & Co., Chicago.
Koppers Construction Co., The, Pgh.
McKee, Arthur G., & Co., Cleve.
Perin & Marshall, 11 West 42nd St., N. Y. C.

ENGINEERS—Foundry
Austin Co., The, Cleveland.

ENGINEERS—Industrial
Llewelyn, Thomas J., & Co., Pgh.
Stone, Francis & Hart, 105 Broadway, N. Y. C.

ENGINEERS AND CONTRACTORS
Austin Co., The, Cleveland.
Kennedy, Julian, Pgh.
Koppers Construction Co., The, Pgh.
Laughlin, Alex., & Co., Pgh.
McKee, Arthur G., & Co., Cleve.
Nelsmith, Geo., & Son, Pgh.
Pennsylvania Engng. Wks., New Castle, Pa.
Stevens, Arthur L., Corp., Chicago.
Swindell, W., & Bros., Box 1753, Pgh.

ENGINES—Gas
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.

ENGINES—Oil
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.

ENGINES—Steam
Dake Engine Co., Grand Haven, Mich.

EYELET MACHINES
Manville, E. J., Mch. Co., Waterbury, Ct.

EYELETS
Platt Bros. & Co., The, Waterbury, Ct.

FACING CLAY
West Virginia Fire Clay Mfg. Co., 1705 Diamond Bank Bldg., Pittsburgh, Pa.

FACING MACHINES—Structural
Thomas Spacing Mch. Co., Pgh., Pa.

FACTORY CONSTRUCTION
Austin Co., The, Cleveland.

FACTORY AND PLANT SITES
McCord, Joseph A., Atlanta, Ga.

FANS—Man Cooling
Coppus Engng. Corp., Worcester, Mass.

FELTS—Wool Mechanical
Booth Felt Co., Inc., The, 477-479 19th St., Bkyn., N. Y.
Continental Felt Co., 900 B'way, N. Y. C.
Felters Co., The, Boston, Mass.

FENCES—Woven Wire
Page Steel & Wire Co., Bridgeport, Ct

FENCING—Wire
Bethlehem (Pa.) Steel Co.
Jones & Laughlin Steel Corp., Pgh.

FERRO ALLOYS—Chromium
Lavino, E. J., & Co., Phila.
Pittsburgh Metallurgical Co., Niagara Falls, N. Y.
Samuel, Frank, & Co., Phila.

ALL THESE COMPANIES CARRY AN AD IN THIS ISSUE
ALPHABETICAL INDEX . . . . PAGES 240-242

FERRO ALLOYS—Manganese
Lavino, E. J., & Co., Phila.
Pittsburgh Metallurgical Co., Niagara Falls, N. Y.
Rogers Brown & Crocker Bros., Inc., 21 East 40th St., N. Y. C.
Samuel, Frank, & Co., Phila.

FERRO ALLOYS—Molybdenum
Lavino, E. J., & Co., Phila.

FERRO ALLOYS—Silicon
Lavino, E. J., & Co., Phila.
Pittsburgh Metallurgical Co., Niagara Falls, N. Y.
Rogers Brown & Crocker Bros., Inc., 21 East 40th St., N. Y. C.
Samuel, Frank, & Co., Phila.

FERRO ALLOYS—Silicon Aluminum
Pittsburgh Metallurgical Co., Niagara Falls, N. Y.

FERRO ALLOYS—Spiegeleisen
New Jersey Zinc Sales Co., Inc., 160 Front St., N. Y. C.
Rogers Brown & Crocker Bros., Inc., 21 E. 40th St., N. Y. C.

FERRO ALLOYS—Titanium
Titanium Alloy Mfg. Co., Niagara Falls, N. Y.

FERRO ALLOYS—Tungsten
Lavino, E. J., & Co., Phila.

FERRO ALLOYS—Vanadium
Lavino, E. J., & Co., Phila.

FILES AND RASPS
Atkins, E. C., & Co., Indianapolis, Ind.
Heller Bros. Co., Newark, N. J.

FILTERS—Pressure or Gravity
Scaife, Wm. B., & Sons Co., Ptgh.

FIRE CLAY
General Refractories Co., Phila.
North American Refractories Co., Cleveland, Ohio.
West Virginia Fire Clay Mfg. Co., 1705 Diamond Bank Bldg., Ptgh.

FITTINGS—Hydraulic
Watson-Stillman Co., 71 West St., N. Y. C.

FLANGES—Forged Steel
Cann & Saul Steel Co., Phila.
Taylor Forge & Pipe Wks., Chicago.

FLANGES—Iron or Steel
Philadelphia (Pa.) Steel & Iron Co.

FLANGES—Upset Forged
Amer. Forge Co., 2621 S. Hoyne Ave., Chicago.

FLASKS—Foundry
Amer. Fdry. Equip. Co., Mishawaka, Ind.

FLEXIBLE SHAFT EQUIPMENT
Fischer, Chas., Spring Co., 242 Kent Ave., Brooklyn, N. Y.
Keller Mechanical Engng. Corp., 78 Washington St., Brooklyn, N. Y.

FLOOR ARMORING
Blaw-Knox Co., Ptgh.
Hendrick Mfg. Co., Carbondale, Pa.

FLOORING—Creosoted Wood
Jennison-Wright Co., Toledo

FLOORING—Steel
Blaw-Knox Co., Pittsburgh.

FLUORSPAR
Lavino, E. J., & Co., Phila.
Rogers Brown & Crocker Bros., Inc., 21 E. 40th St., N. Y. C.

FORGES—Rivet
Buffalo (N. Y.) Forge Co., 492 B'way
Champion Blower & Forge Co., Lancaster, Pa.
Hauck Mfg. Co., 128 Tenth St., Bkyn., N. Y.

FORGING MACHINES
Acme Machinery Co., Cleveland.
National Machinery Co., Tiffin, O.

FORGINGS—Alloy Steel
Amer. Forge Co., 2621 S. Hoyne Ave., Chicago.
Bethlehem (Pa.) Steel Co.
Cann & Saul Steel Co., Phila.
Erie (Pa.) Forge Co.
Heppenstall Co., Pittsburgh.
Machinery Forging Co., The, Cleveland, O.
National Forge & Ordnance Co., Irvine, Pa.

FORGINGS—Brass, Bronze or Copper
Bossert Corp., The, Utica, N. Y.

FORGINGS—Coin Pressed
Rockford (Ill.) Drop Forge Co.

FORGINGS—Drop, Iron or Steel
American Forging & Socket Co., Pontiac, Mich.
Atlas Drop Forge Co., Lansing, Mich.
Bay City Forge Co., Erie, Pa.
Belden Machine Co., New Haven, Ct.
Bethlehem (Pa.) Steel Co.
Billings & Spencer Co., Hartford, Conn.
Cann & Saul Steel Co., Phila.
Canton (O.) Forge & Axle Co.
Champion Machine & Forging Co., Cleve.
Clapp, E. D., Mfg. Co., The, 86 E. Division St., Auburn, N. Y.
Cleveland (O.) Hardware Co., The
Davenport (Iowa) Locomotive & Mfg. Corp.
Drop Forging Co. of New York, Jersey City, N. J.
Gears & Forgings, Inc., 3124 Woodhill Road, Cleveland.
General Drop Forge Co., Buffalo, N. Y.
Henry Forge & Tool, Inc., Auburn, N. Y.
Indianapolis (Ind.) Drop Forging Co.
Keystone Forging Co., Northumberland, Pa.
Laclede Steel Co., St. Louis, Mo.
Milwaukee (Wis.) Forge & Mch. Co.
Oliver Iron & Steel Corp., Ptgh.
Paul, W. P., Co., Phila.
Philadelphia (Pa.) Steel & Iron Co.
Rhode Island Tool Co., Providence, R. I.
Rockford (Ill.) Drop Forge Co.
Scholihorn, Wm. Co., The, New Haven, Conn.
Storms Drop Forging Co., East Springfield, Mass.
Union Switch & Signal Co., Swissvale, Pa.
U. S. Body & Forging Co., Inc., Buffalo, N. Y.
Wilcox, D., Mfg. Co., Mechanicsburg, Pa.
Williams, J. H., & Co., Buffalo, N. Y.

FORGINGS—Hammered
Davenport (Iowa) Locomotive & Mfg. Corp
Erie (Pa.) Forge Co.
Machinery Forging Co., The, Cleveland, O.

FORGINGS—Hollow
American Forge Co., 2621 S. Hoyne Ave., Chicago.
Erie (Pa.) Forge Co.
National Forge & Ordnance Co., Irvine, Pa.

FORGINGS — Hydraulic Press, Iron or Steel
Atlas Drop Forge Co., Lansing, Mich.
Bethlehem (Pa.) Steel Co.
Champion Mach. & Forging Co., Cleve.
Erie (Pa.) Forge Co.
Pittsburgh (Pa.) Forge & Iron Co.

FORGINGS—Manganese Steel
Manganese Steel Forge Co., Phila.

FORGINGS—Upset
Amer. Forge Co., 2621 S. Hoyne Ave., Chicago.
Canton (O.) Forge & Axle Co.
Neely Nut & Bolt Co., Ptgh.
Oliver Iron & Steel Corp., Ptgh.
Rockford (Ill.) Drop Forge Co.

FORMING AND COILING MACHINES
Yoder Co., The, Cleveland.

FOUNDRY EQUIPMENT AND SUPPLIES
Amer. Fdry. Equip. Co., Mishawaka, Ind.
Clifton Mchry. Co., Cincinnati.
National Engineering Company, Chicago.
Osborn Mfg. Co., The, Cleveland.
Sly, W. W., Mfg. Co., Cleveland, O.
Whiting Corp., Harvey, Ill.

FROGS AND SWITCHES—Railway
Bethlehem (Pa.) Steel Co.

FURNACES—Billet or Ingot Heating
Hagan, Geo. J., Co., Pittsburgh.
Nalsmith, Geo., & Son, Ptgh.
Swindell, W., & Bros., Box 1753, Ptgh.

FURNACES—Blast
McKee, Arthur G., & Co., Cleve.
Muskegon (Mich.) Boiler Wks.
Pennsylvania Engng. Wks., New Castle Pa.

FURNACES—Crucible
Swindell, W. & Bros., Box 1753, Ptgh.

FURNACES—Electric Steel Melting
Detroit (Mich.) Electric Furnace Co.
Pittsburgh (Pa.) Electric Furnace Corp.
Swindell, W., & Bros., Box 1753, Ptgh.

FURNACES—Enameling
Carborundum Co., The, Perth Amboy, N. J.

FURNACES—Forging
Best, W. N., Corp., 295 5th Ave., N.Y.C.
Holcroft & Co., Detroit.
Nalsmith, Geo., & Son, Ptgh.
Rockwell, W. S., Co., 50 Church St., N.Y.C.
Swindell, W. & Bros., Box 1753, Ptgh.

FURNACES—Heat Treating, Automatic
Hevi Duty Electric Co., Milwaukee.
Holcroft & Co., Detroit.
McCann-Harrison Corp., Cleve.
Rockwell, W. S., Co., 50 Church St., N.Y.C.

FURNACES—Heat Treating, Cyanide or Lead
American Electric Furnace Co., Boston.
Amer. Gas Furnace Co., Elizabeth, N. J.
Hevi Duty Electric Co., Milwaukee.

FURNACES—Heat Treating, Electric
American Electric Furnace Co., Boston.
Electric Furnace Co., Salem, Ohio.
Hagan, Geo. J., Co., Pittsburgh.
Hevi Duty Electric Co., Milwaukee.
Holcroft & Co., Detroit.
Hoskins Mfg. Co., Detroit.
Rockwell, W. S., Co., 50 Church St., N.Y.C
Strong, Carlisle & Hammond Co., Cleve.
Swindell, W. & Bros., Box 1753, Ptgh.

FURNACES—Heat Treating, Oil, Gas or Coal Fired
Amer. Gas Furnace Co., Elizabeth, N. J.
Anthony Co., The, Long Island City, N. Y.
Best, W. N., Corp., 295 5th Ave., N.Y.C.
Economy Furnace Co., Chicopee, Mass.
Electric Furnace Co., Salem, Ohio.
Hagan, Geo. J., Co., Pittsburgh.
Holcroft & Co., Detroit.
McCann-Harrison Corp., Cleve.
Rockwell, W. S., Co., 50 Church St., N.Y.C.
Strong, Carlisle & Hammond Co., Cleve.
Swindell, W. & Bros., Box 1753, Ptgh.

FURNACES—High-Speed Steel
American Electric Furnace Co., Boston.
Nalsmith, Geo., & Son, Ptgh.
Swindell, W. & Bros., Box 1753, Ptgh.

FURNACES—Non-Ferrous Melting
American Electric Furnace Co., Boston.
Detroit (Mich.) Electric Furnace Co.
Whiting Corp., Harvey, Ill.

FURNACES—Open Hearth
Laughlin, Alex., & Co., Ptgh.
Nalsmith, Geo., & Son, Ptgh.
Stevens, Arthur L., Corp., Chicago.
Swindell, W., & Bros., Box 1753, Ptgh.

FURNACES—Recuperative
Nalsmith, Geo., & Son Ptgh.

FURNACES—Regenerative
Nalsmith, Geo., & Son, Ptgh.

FURNACES—Salt Bath
Economy Furnace Co., Chicopee, Mass.

FURNACES—Soaking Pit
Nalsmith, Geo., & Son, Ptgh.

FURNACES—Steel Mill
Nalsmith, Geo., & Son, Ptgh.

FURNACES—Tube Welding & Bending
Nalsmith, Geo., & Son, Ptgh.

FURNACES—Wire, Annealing & Galvanizing
Vaughn Mchry. Co., Cuyahoga Falls, O.

FURNITURE—Mill and Factory
Vitek Mfg. Co., Omaha, Neb.

FUSE METAL
Platt Bros. & Co., The, Waterbury, Ct.

GAGES—Pressure and Vacuum
Bristol Co., Waterbury, Ct.
Marshalltown (Iowa) Mfg. Co.
Taylor Instrument Companies, Rochester, N. Y.

GAGES—Rolling Mill
Haines Gauge Co., Phila.

GAGES—Thread Lead
Jones & Lamson Mch. Co., Springfield, Vt.

GALVANIZING
Cattie Brothers Corp., Phila.
Cattie, Joseph P., & Bros., Phila.
Meaker Co., The, Chicago.
Newark (N. J.) Galvanizing Co.

GALVANIZING EQUIPMENT—Electro
Meaker Co., The, Chicago.

GALVANIZING PLANTS—For Sheets
Aetna-Standard Eng. Co., Youngstown, O.
Erie (Pa.) Fdry. Co.
Meaker Co., The, Chicago.
United Engng. & Fdry. Co., Ptgh.

GALVANIZING & TINNING EQUIPMENT—Wire
Vaughn Mchry. Co., Cuyahoga Falls, O.

GAS—Exhausters
Roots, P. H. & F. M., Co., Connersville, Ind.

GAS CLEANERS
Research Corp., 25 West 43rd St., N. Y. C.

GAS PRODUCERS
Duff Patents Co., Inc., Ptgh.
Koppers Construction Co., The, Ptgh.
Swindell, W. & Bros., Box 1753, Ptgh.
Wood, R. D., & Co., Philadelphia.

GAS RECOVERY COKE OVENS
Koppers Construction Co., The, Ptgh.

GAS WASHERS
Brassert, H. A., & Co., Chicago.

GASKETS—Felt
Booth Felt Co., Inc., The, 477-479 19th St., Bklyn.
Continental Felt Co., 890 B'way, N. Y. C.
Felters Co., The, Boston, Mass.

GATES—Blast
Rockwell, W. S., Co., 50 Church St., N.Y.C.

GEAR CUTTING
Akron (O.) Gear & Engng. Co.
Bethlehem (Pa.) Steel Co.
Dundore Mfg. Co., Reading, Pa.
Earle Gear & Machine Co., Phila.
Farrel-Birmingham Co., Inc., Buffalo, N. Y.
Ferguson Gear Co., Gastonia, N. C.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Gears & Forgings, Inc., 3124 Woodhill Road, Cleveland.
Grant Gear Works, Boston.
Hartford (Ct.) Special Mchry. Co.
Hindley Gear Co., Phila.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.
Pennsylvania Gear & Mch. Co., Phila.
Philadelphia (Pa.) Gear Works.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

GEAR CUTTING MACHINES
Brown & Sharpe Mfg. Co., Prov., R. I.
Farrel-Birmingham Co., Inc., Buffalo, N. Y.
Whiton, D. E., Mch. Co., New London, Ct.

GEAR DRIVES—Herringbone
Farrel-Birmingham Co., Inc., Buffalo, N. Y.
Lewis Fdry. & Mch. Co., Ptgh.

GEAR HOBBING MACHINES
Adams Co., The, Dubuque, Iowa
Barber-Colman Co., Rockford, Ill.
Gould & Eberhardt, Newark, N. J.

GEARS—Bevel
Earle Gear & Machine Co., Phila.
Ferguson Gear Co., Gastonia, N. C.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Gears & Forgings, Inc., 3124 Woodhill Road, Cleveland.
Grant Gear Works, Boston
Hartford (Ct.) Special Mchry. Co.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.
Pennsylvania Gear & Mch. Co., Phila.
Philadelphia (Pa.) Gear Works

GEARS—Cast
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.

GEARS—Double Helical Cut
De Laval Steam Turbine Co., Trenton, N. J.
Farrel-Birmingham Co., Inc., Buffalo, N. Y.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.

GEARS—Enclosed Herringbone Transmission
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.

GEARS—Heat Treated
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Gears & Forgings, Inc., 3124 Woodhill Road, Cleveland.

GEARS—Herringbone
Bethlehem (Pa.) Steel Co.
Earle Gear & Machine Co., Phila.
Farrel-Birmingham Co., Inc., Buffalo, N. Y.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Philadelphia (Pa.) Gear Works

GEARS—Machine Cut
Adams Co., The, Dubuque, Ia.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Gears & Forgings, Inc., 3124 Woodhill Road, Cleveland.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.

GEARS—Machine Molded
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.
Poole Engng. & Mch. Co., Balto., Md.

GEARS—Non-Metallic
Akron (O.) Gear & Engng. Co.
Chicago (Ill.) Rawhide Mfg. Co., 1313 Elston Ave
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Gears & Forgings, Inc., 3124 Woodhill Road, Cleveland.
Grant Gear Works, Boston.
Horsburgh & Scott Co., Cleve.
Pennsylvania Gear & Mch. Co., Phila.
Philadelphia (Pa.) Gear Works

GEARS—Rawhide
Chicago (Ill.) Rawhide Mfg. Co., 1313 Elston Ave.
Ferguson Gear Co., Gastonia, N. C.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Gears & Forgings, Inc., 3124 Woodhill Road, Cleveland.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.

GEARS—Speed Reducing
Cleveland (O.) Worm & Gear Co.
Farrel-Birmingham Co., Inc., Buffalo, N. Y.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Hindley Gear Co., Phila.
Horsburgh & Scott Co., Cleve.

ALL THESE COMPANIES CARRY AN AD IN THIS ISSUE
ALPHABETICAL INDEX . . . . PAGES 240-242

Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.
Philadelphia (Pa.) Gear Works
Poole Engng. & Mch. Co., Balto., Md.

GEARS—Spiral

Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Ferguson Gear Co., Gastonia, N. C.
Gears & Forgings, Inc., 3124 Woodhill Road, Cleveland.

GEARS—Spur

Boston Gear Works Sales Co., Norfolk Downs, Mass.
Earle Gear & Mach. Co., Phila.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Gears & Forgings, Inc., 3124 Woodhill Road, Cleveland.
Grant Gear Works, Boston.
Hartford (Ct.) Special Mchry. Co.
Horsburgh & Scott Co., Cleve.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.
Pennsylvania Gear & Mch. Co., Phila.
Philadelphia (Pa.) Gear Wks.

GEARS—Worm

Akron (O.) Gear & Engng. Co.
Cleveland (O.) Worm & Gear Co.
Ferguson Gear Co., Gastonia, N. C.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Gears & Forgings, Inc., 3124 Woodhill Road, Cleveland.
Grant Gear Works, Boston.
Hartford (Ct.) Special Mchry. Co.
Hindley Gear Co., Phila.
Horsburgh & Scott Co., Cleve.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.
Philadelphia (Pa.) Gear Works

GEARS—Worm, Speed Reducers

Cleveland (O.) Worm & Gear Co.
De Laval Steam Turbine Co., Trenton, N. J
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.
Philadelphia (Pa.) Gear Works.

GENERATORS—Acetylene

Air Reducing Sales Co., 342 Madison Ave., N. Y. C.
Harris Calorific Co., Cleveland.
Oxweld Acetylene Co., 30 E. 42nd St., N. Y. C.

GENERATORS—Electric

Lincoln Electric Co., Cleveland.

GENERATORS—Electric, Second Hand

Archer & Baldwin, Inc., 126 Liberty St. N. Y. C.
Belyea Co., Inc., 147 W. 18th St., N Y. C.
Zelnicker in St. Louis, Mo.

GENERATORS—Electroplating

Columbia Electric Mfg. Co., Cleveland.
Meaker Co., The, Chicago.

GLUE HEATERS

Dart, E. M., Mfg. Co., Prov., R. I.

GOVERNORS—Air Compressor

Westinghouse Traction Brake Co., Wilmerding, Pa.

GRATING—Flooring, Sidewalk, Etc.

Blaw-Knox Co., Ptgh.
Hendrick Mfg. Co., Carbondale, Pa.

GRATING—Steel

Blaw-Knox Co., Ptgh.

GRINDING AND POLISHING MACHINES

Bridgeport (Ct.) Safety Emery Wheel Co., Inc.
Calder, Geo. H., Lancaster, Pa.
Cincinnati (Ohio) Electrical Tool Co.
Excelsior Tool & Mch. Co., East St. Louis, Ill.
Hammond Mchry. Builders, Inc., Kalamazoo, Mich.
Hisey-Wolf Mch. Co., Cincinnati, Ohio.
Marschke Mfg. Co., Towson, Md.
Ransom Mfg. Co., Oshkosh, Wis.
Royersford (Pa.) Fdry. & Mch. Co., Inc.
Safety Grinding Wheel & Mch. Co., The, Springfield, O.
Springfield Mfg. Co., Bridgeport, Ct.
Sterling Grinding Wheel Co., Tiffin, Ohio.

GRINDING MACHINES—Cam

Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES—Cutter and Reamer

Landis Tool Co., Waynesboro, Pa.
Thompson Grinder Co., Springfield, O.

GRINDING MACHINES—Cylindrical

Brown & Sharpe Mfg. Co., Prov., R. I.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES—Die

Bignall & Keeler Mch. Wks., Edwardsville, Ill.

GRINDING MACHINES—Disc

Gardner Mach. Co., Beloit, Wis.
Production Mch. Co., Greenfield, Mass.

GRINDING MACHINES—Drill

Sellers, William, & Co., Inc., Phila.

GRINDING MACHINES—Flexible Shaft

Keller Mechanical Engng. Corp., 78 Washington St., Brooklyn, N. Y.

GRINDING MACHINES—Internal

Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES — Machine Knives

Atkins, E. C., & Co., Indianapolis, Ind.
Bridgeport (Ct.) Safety Emery Wheel Co., Inc.

GRINDING MACHINES—Portable Electric

Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
Hisey-Wolf Mch. Co., Cincinnati, Ohio.

GRINDING MACHINES—Portable Pneumatic

Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
Cleveland (O.) Pneumatic Tool Co., The.

GRINDING MACHINES—Roll

Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES—Second Hand

Morey & Co., Inc., 410 Broome St N. Y. C.

GRINDING MACHINES—Snagging

Ransom Mfg. Co., Oshkosh, Wis.
Standard Electrical Tool Co., The, Cinci

GRINDING MACHINES—Spring

Sleeper & Hartley, Inc., Worcester, Mass.

GRINDING MACHINES—Surface

Abrasive Machine Tool Co., E. Prov., R. I.
Blanchard Mach. Co., Cambridge, Mass.
Bridgeport (Ct.) Safety Emery Wheel Co., Inc.

GRINDING MACHINES—Swing Frame

Marschke Mfg. Co., Towson, Md.
Safety Grinding Wheel & Mch. Co., The, Springfield, O.

GRINDING MACHINES—Tool

Landis Tool Co., Waynesboro, Pa.
LeBlond, R. K., Mch. Tool Co., Cinn.
Ransom Mfg. Co., Oshkosh, Wis.
Sellers, William, & Co., Inc., Phila.
Taylor & Fenn Co., Hartford, Ct.

GRINDING MACHINES—Universal

Landis Tool Co., Waynesboro, Pa.
Simmons Mach. Tool Corp., Albany, N. Y.
Thompson Grinder Co., Springfield, O.

GRINDING MACHINES—Valve

Defiance (O.) Machine Works

GRINDING MACHINES—Vertical Surface

Blanchard Mach. Co., Cambridge, Mass

GRINDING WHEEL DRESSERS AND CUTTERS

Atkins, E. C., & Co., Indianapolis, Ind.
Calder, Geo. H., Lancaster, Pa.
Dickinson, Thos. L., 34 Gold St., N. Y. C.

GRINDING WHEELS

Atkins, E. C., & Co., Indianapolis, Ind.
Carborundum Co., The, Niagara Falls, N. Y.
New York Belting & Packing Co., 91-93 Chambers St., N. Y. C.
Safety Grinding Wheel & Mch. Co., The, Springfield, O.
Simonds Saw & Steel Co., Fitchburg, Mass.
Springfield Mfg. Co., Bridgeport, Ct.
Sterling Grinding Wheel Co., Tiffin, Ohio.

GUARDS—Machinery

Buffalo (N. Y.) Wire Works Co., Inc.

GUTTERS

Newport (Ky.) Rolling Mill Co.

HACK SAW BLADES—See Saws—Hack Saw Blades

HACK SAW MACHINES

Armstrong-Blum Mfg. Co., Chicago.
Atkins, E. C., & Co., Indianapolis, Ind.
Peerless Machine Co., Racine, Wis.
Racine Tool & Mch. Co., 1755 State St., Racine, Wis.

HAMMER RAMS

Heppenstall Co., Pittsburgh.

HAMMERS—Air

Nazel Engrg. & Mch. Wks., Phila.

HAMMERS—Belt or Motor Driven (Forging)

Barber-Stockwell Co., Cambridge, Mass
Chambersburg (Pa.) Engng. Co.
Moloch Fdry. & Mch. Co., Kaukauna, Wis.
Nazel Engrg. & Mch. Wks., Phila.

HAMMERS—Belt or Motor Driven (Sheet Metal)

Quickwerk Co., The (Not Incorporated—H. Collier Smith, Owner), St. Mary's Ohio.
Yoder Co., The, Cleveland.

HAMMERS—Board Drop

Billings & Spencer Co., Hartford, Conn.
Erie (Pa.) Foundry Co.

HAMMERS—Drop

Billings & Spencer Co., Hartford, Conn.
Chambersburg (Pa.) Engng. Co.
Erie (Pa.) Fdry. Co.
Industrial Brownhoist Corp., Cleveland.
Merrill Bros., Maspeth, N. Y.
Miner & Peck Dept. Farrel-Birmingham Co., Inc., Derby, Conn.
Morgan Engng. Co., Alliance, O.
Standard Machinery Co., Auburn, R.I.

HAMMERS—Pneumatic

Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
Cleveland (O.) Pneumatic Tool Co., The
Ingersoll-Rand Co., 11 B'way, N. Y. C.

HAMMERS—Pneumatic Forging

Sullivan Machinery Co., Chicago.

HAMMERS—Rawhide

Chicago (Ill.) Rawhide Mfg. Co., 1313 Elston Ave.

HAMMERS—Steam

Erie (Pa.) Foundry Co.
Industrial Brownhoist Corp., Cleveland.
Morgan Engng. Co., Alliance, O.

HANDLES—File

Kaalot Mfg. Co., Chicago.

HANGERS—Factory Door

Myers, F. E., & Bro. Co., Ashland, O.

HANGERS—Shaft

American Pulley Co., Philadelphia
Hyman, Joseph, & Sons, Phila.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.

HARDNESS TESTING MACHINES

Shore Instrument & Mfg. Co., Inc., Jamaica, L. I., N. Y.
Wilson-Maeulen Co., Inc., 738 E. 143d St., N. Y. C.

HARDWARE—Carriage and Wagon

Clapp, E. D., Mfg. Co., The, 86 S. Division St., Auburn, N. Y.

HEADING MACHINES

National Mchry. Co., Tiffin, Ohio.

HEAT TREATING

General Machine Wks., York, Pa.
Matthews Mfg. Co., Worcester, Mass.
Parish Pressed Steel Co., Reading, Pa.

HEATERS—Unit

Modine Mfg. Co., Racine, Wis.

HEATING AND VENTILATING APPARATUS

Buffalo (N. Y.) Forge Co., 492 B'way
Modine Mfg. Co., Racine, Wis.

HINGES—Wrought Brass Butt

Veeder-Root, Inc., Hartford, Ct.

HINGES—Wrought Steel & Brass

Hager, C., & Sons Hinge Mfg. Co., St. Louis, Mo.

HOBS

Barber-Colman Co., Rockford, Ill.

HOISTING MACHINES

Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

HOISTS—Air

Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
Duke Engine Co., Grand Haven, Mich.
Detroit (Mich.) Hoist & Mach. Co.
Hanna Eng. Works, Chicago.
Independent Pneumatic Tool Co., Chicago.
Ingersoll-Rand Co., 11 B'way, N. Y. C.
Northern Engng. Wks., 212 Chene St., Detroit.
Whiting Corp., Harvey, Ill.

HOISTS—Chain

American Monorail Co., The, Cleveland.
Harrington Co., The, Phila.
Yale & Towne Mfg. Co., Stamford, Ct.

HOISTS—Electric

American Crane Co., Inc., The, Friendship, N. Y.
American Engineering Co., Aramingo and Cumberland Sts., Philadelphia.
American Monorail Co., The, Cleveland.
Box Crane & Hoist Corp., Phila.
Detroit (Mich.) Hoist & Mach. Co.
Euclid (O.) Crane & Hoist Co.
Harnischfeger Corp., Milwaukee.
Mallory Machry. Corp., Baltimore.
Maris Brothers, Inc., Phila.
Milwaukee (Wis.) Elec. Crane & Hoist Corp.
Northern Engng. Wks., 212 Chene St., Detroit.
Payne, N. B., & Co., 25 Church St., N. Y. C.
Roeper Crane & Hoist Works, Inc., Reading, Pa.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Yale & Towne Mfg. Co., Stamford, Ct.

HOISTS—Electric Traveling

American Engineering Co., Aramingo and Cumberland Sts., Philadelphia.
Box Crane & Hoist Corp., Phila.
Euclid (O.) Crane & Hoist Co.
Harnischfeger Corp., Milwaukee.
Milwaukee (Wis.) Elec. Crane & Hoist Corp.
Northern Engng. Wks., 212 Chene St., Detroit.
Robbins & Myers, Inc., Springfield, Ohio.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

HOISTS—Monorail

American Engineering Co., Aramingo and Cumberland Sts., Philadelphia.
Euclid (O.) Crane & Hoist Co.
Milwaukee (Wis.) Elec. Crane & Hoist Corp.
Robbins & Myers, Inc., Springfield, Ohio.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

HOISTS—Skip

Bartlett, C. O. & Snow Co., Cleve.

HOLDERS—Nipple

Curtis & Curtis Co., Bridgeport, Ct.

HONING MACHINES

Barnes Drill Co., Inc., Rockford, Ill.

HOOPS AND BANDS

Ryerson, Jos. T., & Son, Inc., Chicago.

HOSE—Air, Oil, Steam and Water

New York Belting & Packing Co., 91-93 Chambers St., N. Y. C.

HYDRANTS—Fire

Wood, R. D., & Co., Philadelphia.

HYDRAULIC MACHINERY

American Fluid Motors Co., 2410 Aramingo Ave., Philadelphia.
Baker Engng. Co., Phila.
Bethlehem (Pa.) Steel Co.
Birdsboro (Pa.) Steel Fdry. & Mch. Co.
Chambersburg (Pa.) Engrg. Co.
Elmes, Chas. F., Engrg. Wks., Chicago.
French Oil Mill Mchry. Co., Piqua, O.
Lake Erie Engng. Corp., Buffalo, N. Y.
Morgan Engineering Co., Alliance, O.
Watson-Stillman Co., 71 West St., N. Y. C.
Wood, R. D., & Co., Philadelphia.

HYDROGEN

International Oxygen Co., Newark, N. J.

HYPODERMIC NEEDLE TUBING

Summerill Tubing Co., Bridgeport, Montgomery County, Pa.

ICE HANDLING MACHINERY

Lewis-Shepard Co., 122 Walnut St., Watertown Station, Boston.

INDUCTION STEEL ELECTRIC

Heppenstall Co., Pittsburgh.

INGOT MOLDS

Bethlehem (Pa.) Steel Co.
Shenango-Penn Mold Co., Pittsburgh.
Valley Mould & Iron Corp., Hubbard, O.

INGOTS—Aluminum

Erdle Perforating Co., Rochester, N. Y.

INGOTS—Phosphor Bronze

Phosphor Bronze Smelting Co., Phila.

INSTRUMENTS—Recording

Bristol Co., Waterbury, Ct.
Taylor Instrument Companies, Rochester, N. Y.

IRON BARS

Pittsburgh (Pa.) Forge & Iron Co.
Wrought Iron Company of America, Lebanon, Pa.

IRON—Chain

Bethlehem (Pa.) Steel Co.

IRON—(Genuine Open Hearth Iron)

Newport (Ky.) Rolling Mill Co.

IRON—Genuine Wrought

Reading (Pa.) Iron Co.

IRON—Stainless

Firth-Sterling Steel Co., McKeesport, Pa.

IRON—Staybolt

Bethlehem (Pa.) Steel Co.
Burden Iron Co., The, Troy, N. Y.
Ryerson, Jos. T., & Son, Inc., Chicago.
Wrought Iron Company of America, Lebanon, Pa.

JIGS, FIXTURES, TOOL, ETC.—See Tools, Jigs, Fixtures, Etc.

KEYS—Machine

Buffalo (N. Y.) Mch. Key Co.

KEYS—Riveted

Western Wire Products Co., St. Louis.

KEYSEATING MACHINES

Baker Bros., Inc., Toledo, O.

LACING—Belt, Rawhide or Leather

Chicago (Ill.) Rawhide Mfg. Co., 1313 Elston Ave.

LADLES

Whiting Corp., Harvey, Ill.

LAMPS—Mercury Vapor

General Electric Vapor Lamp Co., Hoboken, N. J.

ALL THESE COMPANIES CARRY AN AD IN THIS ISSUE
ALPHABETICAL INDEX . . . . PAGES 240-242

LATHE CENTERS
Steinle Turret Machine Co., Madison, Wis.

LATHE DOGS
West Steel Casting Co., The, Cleveland.
Williams, J. H., & Co., Buffalo, N. Y.

LATHES—Automatic
Bullard Co., The, Bridgeport, Ct.
Jones & Lamson Mch. Co., Springfield, Vt
LeBlond, R. K., Mch. Tool Co., Cinn.
Monarch Mch. Tool Co., The, Sidney, O.

LATHES—Bench
Rivett Lathe & Grinder Corp., Boston
South Bend (Ind.) Lathe Works.

LATHES—Chucking
Jones & Lamson Mach. Co., Springfield, Vt.

LATHES—Crankshaft
LeBlond, R. K., Mch. Tool Co., Cinn.

LATHES—Engine
American Tool Works Co., Cinci.
Cincinnati (O.) Lathe & Tool Co.
Consolidated Mch. Tool Corp. of America, Rochester, N. Y.
Hendey Mch. Co., Torrington, Ct.
Hill, Clarke & Co. of Chicago, 647 W. Washington Blvd., Chicago, Ill.
LeBlond, R. K., Mch. Tool Co., Cinn
Lodge & Shipley Mch. Tool Co., Cinci.
Monarch Mch. Tool Co., The, Sidney, O.
Osborne & Sexton Mchry. Co., Columbus, O
Reed-Prentice Corp., Worcester, Mass.
Ryerson, Jos. T., & Son, Inc., Chicago.
Sidney (Ohio) Mch. Tool Co.
South Bend (Ind.) Lathe Works.

LATHES—Gap Bed
South Bend (Ind.) Lathe Works.

LATHES—Roll
Lewis Foundry & Mach. Co., Ptgh.
United Engrg. & Fdy. Co., Ptgh.

LATHES—Second-Hand
Botwinik Bros., Inc., New Haven, Ct.
Brownell Mchry. Co., Prov., R. I.
Eastern Mchry. Co., Cincinnati.
Harris Bros. Co., Chicago.
Miles Mchry. Co., Saginaw, W. S., Mich.
Morey & Co., Inc., 410 Broome St., N.Y.C.
New Jersey Mchry. Exchg., Inc., Newark, N. J.
Russell Mch. Co., Ptgh.
Selfreat-Elstad Mchry. Co., Dayton, O.
Simmons Mach. Tool Corp., Albany, N. Y.

LATHES—Spinning
Adriance Mach. Works, Inc., 82 Richards St., Brooklyn, N. Y.

LATHES—Turret
Acme Mch. Tool Co., Cincinnati.
Hardons & Oliver, Cleve.
Bullard Co., The, Bridgeport, Ct.
Cincinnati (O.) Lathe & Tool Co.
Jones & Lamson Mch. Co., Springfield, Vt.
Steinle Turret Machine Co., Madison, Wis.

LEAD BURNING
Gross Lead Burning & Coating Corp., Cleveland.

LEAD BURNING APPARATUS
Oxweld Acetylene Co., 30 E. 42nd St., N. Y. C.

LEAD-LINED APPARATUS
Gross Lead Burning & Coating Corp., Cleveland.

LEATHER—Cup
Chicago (Ill.) Rawhide Mfg. Co., 1313 Elston Ave.

LEATHER—Hydraulic
Chicago (Ill.) Rawhide Mfg. Co., 1313 Elston Ave.

LEVELS—Precision Machine Aligning
Universal Boring Mch. Co., Hudson, Mass.

LIMESTONE—Low Silica
Baker, J. E., Co., York, Pa.

LINING—Converter
Edge Hill Silica Rock Co., New Brunswick, N. J.

LINKS—Chain
Laughlin, Thomas, Co., The, Portland, Me.

LINING—Cupola
Edge Hill Silica Rock Co., New Brunswick, N. J.

LIQUIDATORS
Llewelyn, Thomas J., & Co., Ptgh.
Industrial Plants Corp., 25 Church, New York, N. Y.

LOCK WASHER MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

LOCKS
Yale & Towne Mfg. Co., Stamford, Ct.

LOCOMOTIVES—Electric
Atlas Car & Mfg. Co., Cleve.

LOCOMOTIVES—Gasoline
Plymouth (O.) Locomotive Wks.

LOCOMOTIVES—Industrial
Plymouth (O.) Locomotive Wks.

LOCOMOTIVES—Second Hand
Hyman-Michaels Co., Chicago.

LOCOMOTIVES—Storage Battery
Atlas Car & Mfg. Co., Cleve.

LUGS—Terminal
Wolverine Tube Co., Detroit.

LUMBER—Crosseted or Zinc Treated
Century Wood Preserving Co., Ptgh.
Jennison-Wright Co., Toledo, O.

MACHINE WORK
Cavagnaro, John J., Harrison, N. J.
Cowdrey, C. H., Machine Co., 30 Summer St., Fitchburg, Mass.
Fabricated Steel Products Co., Wheeling, W. Va.
Franklin Mch. Co., Providence, R. I.
General Mach. Works, York, Pa.
Lambert & Todd Mach. Co., Camden, N. J.
Moloch Fdry. & Mch. Co., Kaukauna, Wis.
National Equipment Co., Springfield, Mass.
Royersford (Pa.) Fdry. & Mch. Co., Inc.
Scofield, Gilbert J., Co., Inc., Albany, N. Y.
Sharples Separator Co., West Chester, Pa.

MACHINERY DEALERS
Adams, Ogden R., Rochester, N. Y.
Bennett Mchry. Co., 30 Church St. New York City.
Bernstein, Geo. M., & Co., Chicago, Ill.
Brownell Mchry. Co., Prov., R. I.
Davis, Robert Warren, Detroit, Mich.
Delta Equip. Co., Phila.
Denny, W. I., Chicago, Ill.
Dony, D. E., Rochester, N. Y.
Eastern Mchry. Co., Cincinnati.
Essley, E. L., Mchry. Co., Chicago.
Firm Purchasing Corp., 1 Hanson Place, Brooklyn, N. Y.
General Mchry. Corp., Boston, Mass.
Harris Bros. Co., Chicago.
Hill, Clarke & Co. of Chicago, 647 W. Washington Blvd., Chicago, Ill.
Hitner's, Henry A., Sons Co., Phila., Pa.
International Mchry Co., Detroit.
Johnson, Wm. C., & Sons Mchry. Co., St. Louis, Mo.
Love, A. C., Co., Huntington, W. Va.
Lucas, J. L., & Son, Inc., Bridgeport, Conn.
MacCabe, T. B., Philadelphia, Pa.
Marr-Galbreath Mchry. Co., Ptgh.
Miles Mchry. Co., Saginaw, W. S., Mich.
Morey & Co., Inc., 410 Broome St., N.Y.C.
Moyer, J. N., Philadelphia.
New Jersey Mchry. Exchg., Inc., Newark, N. J.
O'Brien Mchry. Co., Phila.
Randle Machinery Co., 1772 Powers St., Cincinnati
Reliance Mchry. Sales Co., Ptgh.
Riverside Mchry. Depot, Detroit.
Ryerson, Jos. T., & Son, Inc., Chicago.
Schoonmaker, A. O., & Sons, Inc., 30 Church St., N. Y. C.
Selfreat-Elstad Mchry. Co., Dayton, O.
Simmons Mach. Tool Corp., Albany, N. Y.
Smith, H. A., Mchry. Co., Syracuse, N. Y.
Stocker-Rumely-Wachs Co., Chicago.
White, A. D. Machry. Co., Chicago.
Zelnicker in St. Louis, Mo.

MACHINISTS—Contracting
Konigslow, Otto, Mfg. Co., Cleve.

MAGNESITE—Brick or Dead Burnt
Carborundum Co., The, Niagara Falls, N. Y.
Lavino, E. J., & Co., Phila.

MAGNETS—Lifting
Electric Controller & Mfg. Co., Cleve.
Ohio Electric & Mfg. Co., Cleve.

MALLETS
Kaalot Mfg. Co., Chicago.

MALLETS—Rawhide
Chicago (Ill.) Rawhide Mfg. Co., 1313 Elston Ave.

MANUFACTURING SITES
McCord, Joseph A., Atlanta, Ga.

MARKING MACHINES
Noble & Westbrook Mfg. Co., Hartford Ct.

METAL SPECIALTIES
American Pulley Co., Philadelphia
Amer. Spring & Mfg. Corp., Holley, Mich.
Bossert Corp., The, Utica, N. Y.
Cuyahoga Spring Co., Cleve.
Detroit (Mich.) Metal Specialty Corp.
Geuder, Paeschke & Frey Co. (Contract Mfg. Div.), Milwaukee.
Globe Mach. & Stmp. Co., Cleve.
Matthews Mfg. Co., Worcester, Mass.
Metal Specialty Co., Cincinnati.
Torrington (Ct.) Co.
Truscon Steel Co., Pressed Steel Div., Cleveland.
Worcester (Mass.) Pressed Steel Co.
Worcester (Mass.) Stamped Metal Co.
York (Pa.) Corrugating Company.

METALINE
Rhoades, R. W., Metaline Co., Inc., Long Island City, N. Y.

MICA SCHIST
Edge Hill Silica Rock Co., New Brunswick, N. J.

MILLING MACHINES—Die Trimming & Sinking
Billings & Spencer Co., Hartford, Ct.

MILLING MACHINES—Horizontal
Consolidated Mch. Tool Corp. of America, Rochester, N. Y.
Defiance (O.) Mch. Wks.
Hendey Mch. Co., Torrington, Ct.
Kearney & Trecker Corp., Milwaukee.

MILLING MACHINES—Plain
Kearney & Trecker Corp., Milwaukee.
Ryerson, Jos. T., & Son, Inc., Chicago.

MILLING MACHINES—Planer Type
Manning, Maxwell & Moore, Inc., 100 E. 42nd St., N. Y. C.
Sellers, William, & Co., Inc., Phila.

MILLING MACHINES—Second-Hand
Botwinik Bros., Inc., New Haven, Ct.
Eastern Mchry. Co., Cincinnati.
Harris Bros. Co., Chicago.
New Jersey Mchry. Exchg., Inc., Newark, N. J.
Simmons Mach. Tool Corp., Albany, N. Y.

MILLING MACHINES—Universal
Brown & Sharpe Mfg. Co., Prov., R. I.
Ryerson, Jos. T., & Son, Inc., Chicago.

MILLING MACHINES—Vertical
Reed-Prentice Corp., Worcester, Mass.

MIXING MACHINES—Sand
Bartlett, C. O. & Snow Co., Cleve.
National Engineering Co., Chicago.

MOLDING MACHINES—Jarring (Air)
Arcade Mfg. Co., Freeport, Ill.
Herman Pneumatic Mch. Co., Pittsburgh.
Nicholls, Wm. H., Co., Inc., 91st Ave. & 126th St., Richmond Hill, N. Y.
Osborn Mfg. Co., The, Cleveland.

MOLDING MACHINES—Rollover (Hand and Power Operated)
Arcade Mfg. Co., Freeport, Ill.
Herman Pneumatic Mch. Co., Pittsburgh.

MOLDING MACHINES—Sand Throwing
Beardsley & Piper Co., Chicago, Ill.

MOLDING MACHINES—Stripping Plate
Nicholls, Wm. H., Co., Inc., 91st Ave. & 126th St., Richmond Hill, N. Y.

MONEL METAL
International Nickel Co., Inc., 67 Wall St., N. Y. C.

MONORAIL—Overhead
American MonoRail Co., The, Cleveland.

MONORAIL SWITCHES & TURNTABLES
Yale & Towne Mfg. Co., Stamford, Ct.

MOTORS—Electric
Allis-Chalmers Mfg. Co., Milwaukee.
Leland Electric Co., The, Dayton, O.
Lincoln Electric Co., Cleveland.
Ohio Electric & Mfg. Co., Cleve.
Roth Brothers & Co., Div. of Century Electric Co., Chicago.

MOTORS—Electric, Second-Hand
Archer & Baldwin, Inc., 126 Liberty St., N. Y. C.
Belyea Co., Inc., 147 W. 18th St., N. Y.
Botwinik Bros., Inc., New Haven, Ct.
Delta Equip. Co., Phila.
Industrial Power & Equip Co., Ferndale, Mich.
Land, L. J., 207 Centre St., N. Y. C.
O'Brien Machry. Co., Phila.
Sachsenmaier, Geo., Co., Phila., Pa.
Rockford (Ill.) Power Mchry. Co.

NAILS—Cut
Reading (Pa.) Iron Co.

NAILS—Wire
Bethlehem (Pa.) Steel Co.
Wheeling (W. Va.) Steel Corp.

NICKEL
International Nickel Co., Inc., 67 Wall St., N. Y. C.

NICKEL ANODES—Rolled or Cast
Seymour (Ct.) Mfg. Co.

NITROGEN
Air Reduction Sales Co., 342 Madison Ave., N. Y. C.

NUMBERING MACHINES—For Metal
Noble & Westbrook Mfg. Co., Hartford, Ct.

NUT MAKING MACHINERY
National Mchry. Co., Tiffin, Ohio.

NUTS—Acorn
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Western Screw Products Co., St. Louis.

NUTS—Castellated
National Acme Co., The, Cleveland.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Western Screw Products Co., St. Louis.

NUTS—Cold Punched
Milton (Pa.) Mfg. Co.
Oliver Iron & Steel Corp., Ptgh.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS—Hot Pressed
Milton (Pa.) Mfg. Co.
Oliver Iron & Steel Corp., Ptgh.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Wrought Iron Co. of Amer., Lebanon, Pa.

NUTS—Milled
Westfield (Mass.) Nut Co.

NUTS—Semi-Finished
Milton (Pa.) Mfg. Co.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Westfield (Mass.) Nut Co.

NUTS—Thumb Malleable
Philadelphia (Pa.) Hardware & Malleable Iron Wks., Inc.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

OIL STONES
Carborundum Co., The, Niagara Falls, N. Y.

ORES—Chrome, Lump and Ground
Lavino, E. J., & Co., Phila.

ORES—Iron
Cleveland (O.) Cliffs Iron Co
Hanna Furnace Co., The, Cleveland.
Pickands, Mather, & Co., Cleveland.
Pilling & Co., Inc., Phila.
Rogers Brown & Crocker Bros., Inc., 31 East 40th St., N. Y. C.

ORES—Manganese
Lavino, E. J., & Co., Phila.

OVENS—Baking
Drying Systems, Inc., Chicago, Ill.
Gehnrich Oven Co., Inc., Long Island City, N. Y.
McCann-Harrison Corp., Cleve.
Young Bros. Co., Detroit.

OVENS—Coke & By-Product Recovery
Koppers Construction Co., The, Ptgh.

OVENS—Core and Mold
Drying Systems, Inc., Chicago, Ill.
Gehnrich Oven Co., Inc., Long Island City, N. Y.
Holcroft & Co., Detroit.
McCann-Harrison Corp., Cleve.
Maehler, Paul Co., The, Chicago.
Steiner Oven Co., Newark, N. J.
Whiting Corp., Harvey, Ill.
Young Bros. Co., Detroit.

OVENS—Cross Regenerative
Koppers Construction Co., The, Ptgh.

OVENS—Drying
Detroit (Mich.) Sheet Metal Wks.
Drying Systems, Inc., Chicago, Ill.
McCann-Harrison Corp., Cleve.
Maehler, Paul Co., The, Chicago.
Steiner Oven Co., Newark, N. J.
Young Bros. Co., Detroit.

OVENS—Enameling and Japanning
Carborundum Co., The, Perth Amboy, N. J.
Drying Systems, Inc., Chicago, Ill.
Gehnrich Oven Co., Inc., Long Island City, N. Y.
McCann-Harrison Corp., Cleve.
Maehler, Paul Co., The, Chicago.
Steiner Oven Co., Newark, N. J.
Young Bros. Co., Detroit.

OVERHEAD CARRYING EQUIPMENT —See Monorail—Overhead

OXYGEN
Air Reduction Sales Co., 342 Madison Ave., N. Y. C.
International Oxygen Co., Newark, N. J.

PACKING—Leather
Chicago (Ill.) Rawhide Mfg. Co., 1313 Elston Ave.
Watson-Stillman Co., 71 West St., N. Y

PAINT—Heat Resisting
Ultra Fuzon Distributing Co., 151 Fifth Ave., N. Y. C.

PANS—Grinding
National Engineering Co., Chicago.

PATENT ATTORNEYS
Boyle, John, Jr., Washington, D. C.

PATENTING EQUIPMENT—Wire
Vaughn Mchry. Co., Cuyahoga Falls, O.

PATTERNS—Wood and Metal
Bascom & Co., Troy, N. Y.

PERFORATED METAL
Chicago Perforating Co., Chicago, Ill.
Cross Engineering Co., Carbondale, Pa.
Erdle Perforating Co., Rochester, N. Y.
Harrington & King Perforating Co., Chi.
Hendrick Mfg. Co., Carbondale, Pa.
Mundt, Chas., & Sons, Jersey City, N. J.
Wickwire Spencer Steel Co., 41 E. 42nd, N. Y. C.

PHOSPHOR—Copper
Phosphor Bronze Smelting Co., Phila.

PHOSPHORIZERS
McCullough-Dalzell Crucible Co., Ptgh.

PICKLING COMPOUNDS
American Chemical Paint Co., Ambler, Pa.

PICKLING MACHINES
Aetna-Standard Eng. Co., Youngstown, O.
Meaker Co., The, Chicago.

PIG IRON
Alan Wood Steel Co., Conshohocken, Pa.
Bethlehem (Pa.) Steel Company.
Chateaugay Ore & Iron Co., 26 Liberty St., N. Y. C.
Cleveland (O.) Cliffs Iron Co.
Donner Steel Co., Inc., Buffalo, N. Y.
Hanna Furnace Co., The, Cleveland.
Lavino, E. J., & Co., Phila.
Pickands, Mather & Co., Cleve.

ALL THESE COMPANIES CARRY AN AD IN THIS ISSUE
ALPHABETICAL INDEX . . . . PAGES 240-242

Pilling & Co., Inc., Phila.
Republic Iron & Steel Co., Youngstown, O.
Rogers Brown & Crocker Bros., Inc., 21 East 40th St., N. Y. C.
Shenango-Penn Mold Co., Pittsburgh.
Tennessee Coal, Iron & R.R. Co., Birmingham, Ala.
Walter-Wallingford & Co., Cincinnati.
Wickwire Spencer Steel Co., 41 E. 42nd, N. Y. C.

PIG IRON—Low Phosphorus
Chateaugay Ore & Iron Co., 26 Liberty St., N. Y. C.

PILING—Creosoted
Jennison-Wright Co., Toledo.

PILING—Steel Sheet
Bethlehem (Pa.) Steel Company.

PINIONS—Wire and Rod
Rathbone, A. B., & J., Palmer, Mass.

PINS—Cotter
Lamson & Sessions Co., The, Cleveland, O.

PIPE—Cast Iron, B. & S. and Flanged
Wood, R. D., & Co., Philadelphia.

PIPE—Chrome Alloy
Babcock & Wilcox Tube Co., The, 85 Liberty St., N. Y. C.

PIPE—Forged Steel
Kellogg, M. W., Co., The, 225 Bdway., N. Y. C.

PIPE—Fusion Welded
Petroleum Iron Wks. Co., Sharon, Pa.

PIPE—Genuine Wrought Iron
Keating, E. F., Co., 452 Water St. N. Y. C.

PIPE—Hammer Welded
National Tube Co., Pittsburgh.
Reading (Pa.) Iron Co.

PIPE—New and Second-Hand
Albert & Davidson Pipe Corp., 2nd Ave., 50-51st St., Bklyn., N. Y.
Albert Pipe Supply Co., Inc., Berry and N. 13th St., Bklyn, N. Y.
Greenpoint Iron & Pipe Co., Inc., 187-197 Maspeth Ave., Bklyn, N. Y.
Hudson Pipe & Supply Co., Bayonne, N. J.
L. & D. Pipe Supply Co., Inc., 1100 Flushing Ave., Bklyn, N. Y.
Marine Metal & Supply Co., 167 South St., N. Y. C.

PIPE—Riveted Steel
Abendroth & Root Mfg. Co., Newburgh, N. Y.

PIPE—Seamless Iron
Babcock & Wilcox Tube Co., The, 85 Liberty St., N. Y. C.

PIPE—Seamless Steel
Babcock & Wilcox Tube Co., The, 85 Liberty St., N. Y. C.

PIPE—Spiral Riveted
Abendroth & Root Mfg. Co., Newburgh, N. Y.
Taylor Forge and Pipe Works, Chicago.

PIPE—Standard, Black and Galvanized
Bethlehem (Pa.) Steel Co.
Jones & Laughlin Steel Corp., Ptgh.
Keating, E. F., Co., 452 Water St., N. Y. C.
National Tube Co., Pittsburgh.
Republic Iron & Steel Co., Youngstown, O.
Wheeling (W. Va.) Steel Corp.

PIPE—Wrought Iron
Keating, E. F., Co., 452 Water St., N. Y. C.

PIPE BENDING MACHINES
Newbold, B. S., & Son Co., Norristown, Pa.

PIPE CUTTING MACHINES
Murchey Mch. & Tool Co., 951 Porter St., Detroit.
Newbold, B. S., & Son Co., Norristown, Pa.

PIPE CUTTING AND THREADING MACHINES
Aetna-Standard Eng. Co., Youngstown, O.
Bignall & Keeler Mch. Wks., Edwardsville, Ill.
Curtis & Curtis Co., 327 Garden St., Bridgeport, Ct.
Merrell Mfg. Co., Toledo.
Murchey Mach. & Tool Co., 951 Porter St., Detroit.
Pipe Machry. Co., The, Cleveland.
Saunders', D., Sons, Yonkers, N. Y.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

PIPE FITTINGS
Kellogg, M. W., Co., The, 225 Bdway, N. Y. C.
Power Piping Co., Pittsburgh.

PIPING CONTRACTORS
Power Piping Co., Pittsburgh.

PISTON RODS
Heppenstall Co., Pittsburgh.

PLANING MACHINES—Metal
American Tool Works Co., Cinci.
Cincinnati (O.) Planer Co., The.
Cleveland (O.) Planer Co., The.
Consolidated Mch. Tool Corp. of America Rochester, N. Y.
Gray, G. A., Co., Cinci.
Liberty Mch. Tool Co., Hamilton, O.
Manning, Maxwell & Moore, Inc., 100 E. 42nd St., N. Y. C.
Ryerson, Jos. T., & Son, Inc., Chicago.
Sellers, William, & Co., Inc., Phila.

PLANING MACHINES—Open Side
Cincinnati (O.) Planer Co., The.
Cleveland (O.) Planer Co., The.
Gray, G. A., Co., Cinci.
Liberty Mch. Tool Co., Hamilton, O.

PLANING MACHINES—Second Hand
Miles Mchry. Co., Saginaw, W. S., Mich.

PLANTS FOR SALE
Lebanon (Pa.) Boiler Wks., Inc.

PLATERS' CLEANING COMPOUND
American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., 22 Thames St., N. Y.

PLATES—Cellar Door or Floor
Alan Wood Steel Co., Conshohocken, Pa.
American Pressed Steel Co., Phila.
Carnegie Steel Co., Pgh.
Central Iron & Steel Co., Harrisburg, Pa.

PLATES—Feltee
Wrought Washer Mfg. Co., Milwaukee.

PLATES—Iron or Steel
Alan Wood Steel Co., Conshohocken, Pa.
American Pressed Steel Co., Philadelphia.
Bethlehem (Pa.) Steel Company.
Carnegie Steel Co., Pittsburgh.
Central Iron & Steel Co., Harrisburg, Pa.
Illinois Steel Warehouse Co., Chicago.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pgh.
Newport (Ky.) Rolling Mill Co.
Ryerson, Jos. T., & Son, Inc., Chicago.
Tennessee Coal, Iron & Railroad Co. Birmingham, Ala.

PLATES—Manganese Steel
Manganese Steel Forge Co., Phila.

PLATFORMS—Lift Truck
Lansing (Mich.) Co.

PLATFORMS—Skid
Lewis-Shepard Co., 122 Walnut St. Watertown Station, Boston.

PLATING—Chromium
Udylite Process Co., Detroit, Mich.

PLATING—Electro
Meaker Co., The, Chicago.
Udylite Process Co., Detroit, Mich.

PLATING EQUIPMENT—Automatic
Columbia Electric Mfg. Co., Cleveland.
Meaker Co., The, Chicago.

PLATING EQUIPMENT—Chromium
Meaker Co., The, Chicago.

PLUGS—Core Hole
Hubbard, M. D., Spring Co., Pontiac, Mich.

POINTING & THREADING MACHINERY
Economy Engng. Co., The, Willoughby, O.

POLISHING & BUFFING MACHINES
Cincinnati (Ohio) Electrical Tool Co.
Columbia Electric Mfg. Co., Cleveland.
Divine Brothers Co., Utica, N. Y.
Hammond Mchry. Builders, Inc., Kalamazoo, Mich.

POLISHING MACHINES—Belt
Production Mch. Co., Greenfield, Mass.

POLISHING WHEELS
Divine Brothers Co., Utica, N. Y.

POWER TRANSMITTING MACHINERY
American Pulley Co., Philadelphia
Falls Clutch & Mchry. Co., The, Cuyahoga Falls, Ohio.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.

PREHEATERS—Air
Blaw-Knox Co., Ptgh.

PRESS ATTACHMENTS
Littell, F. J., Mach. Co., Chicago.

PRESSED METAL PARTS
Detroit (Mich.) Metal Specialty Corp.

PRESSED STEEL PARTS
American Pulley Co., Philadelphia
Bossert Corp., The, Utica, N. Y.
Detroit (Mich.) Metal Specialty Corp.
Geuder, Paeschke & Frey Co. (Contract Mfg. Div.), Milwaukee.
Matthews Mfg. Co., Worcester, Mass.
Metal Specialty Co., Cincinnati.
New England Pressed Steel Co., 1 Washington Ave., Natick, Mass.
Parish Pressed Steel Co. Reading, Pa
Pressed & Welded Steel Prods. Co., Long Island City, N. Y.
Truscon Steel Co., Pressed Steel Div., Cleveland.
Worcester (Mass.) Pressed Steel Co.
York (Pa.) Corrugating Co.

PRESSES—Bending or Straightening
Watson-Stillman Co., 71 West St., N. Y.

PRESSES—Die
Watson-Stillman Co., 71 West St., N. Y.

PRESSES—Drop
Bliss, E. W. Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Standard Machinery Co., Auburn, R. I.

PRESSES—Extrusion
Robertson, John, Co., 123 Water St., Brooklyn, N. Y.
Watson-Stillman Co., 71 West St., N. Y.

PRESSES—Foot
Adriance Mach. Works, Inc., 82 Richards St., Bklyn, N. Y.
Baird Machine Co., Bridgeport, Ct.
Shuster, F. B., Co., New Haven, Ct.
Taylor & Fenn Co., Hartford, Ct.

PRESSES—Forging
Lucas Mch. Tool Co., Cleve.
Watson-Stillman Co., 71 West St., N. Y.

PRESSES—Forging
Morgan Engineering Co., Alliance, O.
United Engineering & Fdry. Co., Pgh.
Watson-Stillman Co., 71 West St., N. Y.

PRESSES—Forming and Bending
Cincinnati (O.) Shaper Co., The.
Dreis & Krump Mfg. Co., Chicago.
Streine Tool & Mfg. Co., New Bremen, O.

PRESSES—Hot and Cold Plate
Watson-Stillman Co., 71 West St., N. Y.

PRESSES—Hydraulic
Birdsboro (Pa.) Steel Fdry. & Mch. Co.
Elmes, Chas. F., Engrg. Works, Chicago.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
French Oil Mill Machry. Co., Piqua, O.
Galland-Henning Mfg. Co., Milwaukee.
Hydraulic Press Mfg. Co., The, Columbus, Ohio.
Lake Erie Engng. Corp., Buffalo, N. Y.
Morgan Engineering Co., Alliance, O.
Robertson, John, Co., 123 Water St., Brooklyn, N. Y.
Rock River Engng. Co., Janesville, Wis.
Southwark Fdry. & Mach. Co., Phila.
Watson-Stillman Co., 71 West St., N. Y.
Wood, R. D., & Co., Philadelphia.

PRESSES—Multiple Plunger
Waterbury (Ct.) Farrel Fdry. & Mch. Co.

PRESSES—Power
Adriance Machine Works, Inc., 82 Richards St., Bklyn, N. Y.
Baird Machine Co., Bridgeport, Ct.
Bliss, E. W. Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Cincinnati (O.) Shaper Co., The.
Cleveland (O.) Punch & Shear Wks. Co.
Ferracute Machine Co., Bridgeton, N. J.
Hyman, Joseph, & Sons, Phila.
Loy & Nawrath Div. Farrel-Birmingham Co., Inc., Derby, Conn.
Manville, E. J., Mach. Co., Waterbury, Ct.
Minster (O.) Machine Co.
New Albany (Ind.) Mch. Mfg. Co.
Niagara Machine & Tool Works, Buffalo, N. Y.
Ohl, George A., & Co., Inc., Newark, N. J.
Pels, Henry, & Co., 90 West St., N. Y. C.
Rockford (Ill.) Iron Works
Standard Machinery Co., Auburn, R. I.
Toledo (O.) Mach. & Tool Co.
V & O Press Co., Hudson, N. Y.
Verdin, Kappes & Verdin Co., Cinci.
Waterbury (Ct.) Farrel Fdry. & Mch. Co.
Zeh & Hahnemann Co., Newark, N. J

PRESSES—Roofing and Corrugating
Streine Tool & Mfg. Co., New Bremen, O.

PRESSES—Scrap Bundling
Galland-Henning Mfg. Co., Milwaukee.
Hydraulic Press Mfg. Co., The, Columbus, Ohio.
Standard Machinery Co., Auburn, R. I.

PRESSES—Trimming
Erie (Pa.) Foundry Co.
Toledo (O.) Mch. & Tool Co.

PRESSES—Wheel
Bethlehem (Pa.) Steel Co.

PULLEY MACHINERY
Avey Drilling Mch. Co., Cincinnati, O.

PULLEYS—Belt (Pressed Steel)
American Pulley Co., Philadelphia

PULLEYS—Friction Clutch
Caldwell, W. E., Co., 266 Brandeis St., Louisville, Ky.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.

PULLEYS—Iron, Solid and Split
Caldwell, W. E., Co., 266 Brandeis St., Louisville, Ky.
Falls Clutch & Mchry. Co., The, Cuyahoga Falls, Ohio.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.
Medart Co., The, St. Louis, Mo.

PULLEYS—Magnetic
Dings Magnetic Separator Co., Milwaukee.
Magnetic Mfg. Co., Milwaukee.

PULLEYS—Motor and Machine (Compressed Spruce)
American Pulley Co., Philadelphia.

PULLEYS—Steel, Rim Solid and Split
Hyman, Joseph, & Sons, Phila.

PULVERIZERS
American Pulverizer Co., St. Louis, Mo.
Bartlett, C. O. & Snow Co., Cleve.
Bethlehem (Pa.) Steel Co.

PULVERIZERS—Coal
Bartlett, C. O. & Snow Co., Cleve.
Bethlehem (Pa.) Steel Co.
Whiting Corp., Harvey, Ill.

PUMPS—Boiler Feed
Manistee (Mich.) Iron Works Co.
Morris Mch. Works, Baldwinsville, N. Y.

PUMPS—Centrifugal
Allis-Chalmers Mfg. Co., Milwaukee.
De Laval Steam Turbine Co., Trenton, N. J.
Ingersoll-Rand Co. (Cameron), 11 B'way, N. Y. C.
Manistee (Mich.) Iron Works Co.
Morris Mach. Works, Baldwinsville, N. Y.
Penna. Pump & Compressor Co., Easton, Pa.

PUMPS—Electric
Myers, F. E., & Bro. Co., Ashland, O.

PUMPS—Hand & Power
Myers, F. E., & Bro. Co., Ashland, O.

PUMPS—Hydraulic
American Fluid Motors Co., 2410 Aramingo Ave., Philadelphia.
Elmes, Chas. F., Engrg. Works, Chicago.
Galland-Henning Mfg. Co., Milwaukee.
Hydraulic Press Mfg. Co., The, Columbus, Ohio.
Southwark Fdry. & Mch. Co., Phila.
Watson-Stillman Co., 71 West St., N. Y.
Wood, R. D., & Co., Philadelphia.

PUMPS—Pneumatic Air Lift
Sullivan Machinery Co., Chicago.

PUMPS—Vacuum
Bury Compressor Co., Erie, Pa.
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.
Penna Pump & Compressor Co., Easton, Pa.
Sullivan Machinery Co., Chicago.

PUNCHES—Pneumatic
Hanna Engineering Wks. Chicago.

PUNCHES AND DIES
Cleveland (O.) Punch & Shear Wks. Co.
Marchant, Geo. F., Co., Chicago.
Richards, I. P., Co., Providence, R. I.

PUNCHING AND SHEARING MACHINES
Beatty Mch. & Mfg. Co., Hammond, Ind.
Bertsch & Co., Cambridge City, Ind.
Buffalo (N. Y.) Forge Co., 492 B'way.
Cleveland (O.) Punch & Shear Wks. Co.
Consolidated Mch. Tool Corp. of America, Rochester, N. Y.
Excelsior Tool & Mch. Co., East St. Louis, Ill.
Hendley & Whittemore Co., Beloit, Wis.
Long & Allstatter Co., Hamilton, O.
Pels, Henry, & Co., 90 West St., N. Y. C.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Rock River Engng. Co., Janesville, Wis.
Ryerson, Jos. T., & Son, Inc., Chicago.
Smith, David H., & Sons, Inc., Ft. of 51st St., Brooklyn, N. Y.
Southwark Fdry. & Mch. Co., Phila.
Thomas Spacing Mach. Co., Pgh.

PURIFIERS—Oil
De Laval Steam Turbine Co., Trenton, N. J.
National Acme Co., The, Cleveland.

PURIFIERS—Steam
Blaw-Knox Co., Pgh.

PYROMETERS—Indicating
Bristol Co., Waterbury, Ct.
Hoskins Mfg. Co., Detroit.
Taylor Instrument Companies, Rochester, N. Y.
Wilson-Maeulen Co., Inc., 738 E. 149th St., N. Y. C.

PYROMETERS—Purifiers, Gas
Research Corp., 25 West 43rd St., N. Y. C.

RACKS—Industrial Storage
Lewis-Shepard Co., 122 Walnut St., Watertown Station, Boston.

RAIL SPLICE BARS
Ames, W., & Co., Jersey City, N. J.

RAILS
Cohen, Louis, & Son, Wilkes-Barre, Pa.
Frank, M. K., Pittsburgh
Hyman-Michaels Co., Chicago.
Inland Steel Co., Chicago.
Lindheimer, S. W., Inc., Chicago.
Luria Bros. & Co., Inc., Woolworth Bldg., N. Y. C.
Morrison Railway Supply Corp., Buffalo, N. Y.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.

ALL THESE COMPANIES CARRY AN AD IN THIS ISSUE
ALPHABETICAL INDEX . . . . PAGES 240-242

RAILS—Relaying
Continental Iron & Steel Co., 33 Rector St., N. Y. C.
Frank, M. E., Pittsburgh, Pa.
Perry, Buxton, Doane Co., Boston.
Sherwood, E. C., 46 Church St., N. Y. C.
Zelnicker in St. Louis, Mo.

RAILWAY EQUIPMENT AND SUPPLIES
Hyman-Michaels Co., Chicago.
Fort Pitt Malleable Iron Co., Ptgh.
Lindhemer, S. W., Inc., Chicago.
Morrison Railway Supply Corp., Buffalo, N. Y.
Oliver Iron & Steel Corp., Ptgh.
Scullin Steel Co., St. Louis, Mo.
Zelnicker in St. Louis, Mo.

REAMERS—Adjustable and Expansion
Barber-Colman Co., Rockford, Ill.
Brubaker, W. L., & Bros. Co., 50 Church St., N. Y. C.
Cleveland (O.) Twist Drill Co.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Union Twist Drill Co., Athol, Mass.

REGULATORS—Compressed Gas
Harris Calorific Co., Cleveland.
Oxweld Acetylene Co., 30 E. 42nd St., N. Y. C.

RHEOSTATS—Plating Tank
Columbia Electric Mfg. Co., Cleveland.

RINGS—Iron or Steel
Akron-Selle Co., Akron, Ohio.
Edgewater Steel Co., Pittsburgh.
Heppenstall Co., Pittsburgh.
Milwaukee (Wis.) Forge & Mch. Co.

RIVET CUTTING GUNS
Rivet Cutting Gun Co., Cincinnati.

RIVET MAKING MACHINERY
Acme Machinery Co., Cleve.
Manville, E. J., Mach. Co., Waterbury, Ct.
National Mchry. Co., Tiffin, Ohio.

RIVET SETS
Cleveland (O.) Punch & Shear Wks. Co.
Marchant, Geo. F., Co., Chicago.

RIVETING MACHINES
Allen, John F., Co., 373 Gerard Ave., N. Y.
Hanna Engrg. Works, Chicago.
Shuster, F. B., Co., New Haven, Ct.
Watson-Stillman Co., 71 West St., N. Y.
Wood, R. D., & Co., Philadelphia.

RIVETS
Bethlehem (Pa.) Steel Co.
Clark Bros. Bolt Co., Milldale, Conn.
Neely Nut & Bolt Co., Ptgh.
Oliver Iron & Steel Corp., Ptgh.
Progressive Mfg. Co., Torrington, Ct.
Reed & Prince Mfg. Co., Worcester, Mass.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Jos. T., & Son, Inc., Chicago.
Wrought Iron Co. of America, Lebanon, Pa.

RODS—Drill
Globe Wire Company, Div. of the Firth-Sterling Steel Co., Sharpsburg, Pa.
Pittsburgh Tool Steel Wire Co., Monaca, Pa.

RODS—Nickel Silver
Seymour (Ct.) Mfg. Co.

RODS—Phosphor Bronze
Phosphor Bronze Smelting Co., Phila.
Seymour (Ct.) Mfg. Co.

RODS—Welding
Air Reduction Sales Co., 342 Madison Ave., N. Y. C.
Oxweld Acetylene Co., 30 E. 42nd St., N. Y. C.

RODS—Welding, Manganese Steel
Manganese Steel Forge Co., Phila.

RODS—Wire
Washburn Wire Co., Inc., 118th & Harlem River, N. Y. C.
Wickwire Spencer Steel Co., 41 E. 42nd, N. Y. C.

ROLLING MACHINERY—Cold Rolling
Bliss, E. W. Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Kane & Roach, Syracuse, N. Y.
Lewis Foundry & Mach. Co., Ptgh.
Yoder Co., The, Cleveland.

ROLLING MACHINERY—Corrugating
Streine Tool & Mfg. Co., New Bremen, O.

ROLLING MACHINERY—Sheet Leveler
Aetna-Standard Eng. Co., Youngstown, O.
Streine Tool & Mfg. Co., New Bremen, O.

ROLLING MACHINERY—Sheet Metal
Lewis Foundry & Mach. Co., Ptgh.
Streine Tool & Mfg. Co., New Bremen, O.
Yoder Co., The, Cleveland.

ROLLING MACHINERY—Sheet Oiling
Aetna-Standard Eng. Co., Youngstown, O.
Streine Tool & Mfg. Co., New Bremen, O.

ROLLING MILL MACHINERY
Aetna-Standard Eng. Co., Youngstown, O.
Birdsboro (Pa.) Steel Fdry. & Mch. Co.
Bliss, E. W. Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Haines Gauge Co., Phila.
Hyde Park (Pa.) Fdry. & Mch. Co.
Lewis Fdry. & Mch. Co., Ptgh.
Morgan Engineering Co., Alliance, O.
National Roll & Fdry. Co., Avonmore, Pa.
Newbold, R. S., & Son Co., Norristown, Pa.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Standard Machinery Co., Auburn, R. I.
Treadwell Engineering Co., Easton, Pa.
United Engrg. & Fdry. Co., Ptgh.
Waterbury (Ct.) Farrel Fdry. & Mch. Co.

ROLLING MILLS & INDUSTRIAL PLANTS
Foster, Frank B., Pittsburgh, Pa.

ROLLS—Alloy Steel
Duquesne Steel Fdry. Co., Pittsburgh, Pa.
United Engrg. & Fdry. Co., Ptgh.

ROLLS—Bending and Straightening
Bertsch & Co., Cambridge City, Ind.
Bethlehem (Pa.) Steel Co.
Cleveland (O.) Punch & Shear Wks. Co.
Hendley & Whittemore Co., Beloit, Wis.
Lake Erie Engng. Corp., Buffalo, N. Y.
Marshalltown (Iowa) Mfg. Co.
Niagara Machine & Tool Works, Buffalo, N. Y.
Rock River Engng. Co., Janesville, Wis.
Ryerson, Jos. T., & Son, Inc., Chicago.
Southwark Foundry & Mch. Co., Phila.

ROLLS—Galvanizing
Erie (Pa.) Forge Co.

ROLLS—Sand Chilled Iron and Steel
Aetna-Standard Eng. Co., Youngstown, O.
American Steel Foundries, Chicago.
Birdsboro (Pa.) Steel Fdry. & Mch. Co.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Hyde Park (Pa.) Fdry. & Mach. Co.
Lewis Fdry. & Mch. Co., Ptgh.
National Roll & Fdry. Co., Avonmore, Pa.
United Engng. & Fdry. Co., Pittsburgh.

ROLLS—Special Hardened
Bethlehem (Pa.) Steel Co.

ROOFING—Cement Tile
American Cement Tile Mfg. Co., 803 Oliver Bldg., Ptgh.
Federal Cement Tile Co., Chicago.

ROOFING—Concrete
Austin Co., The, Cleveland.

ROOFING—Concrete Slabs
Federal Cement Tile Co., Chicago.

ROOFING—Special Copper Bearing Steel
Newport (Ky.) Rolling Mill Co.

ROOFING AND SIDING—Corrugated and Plain
Newport (Ky.) Rolling Mill Co.
Ryerson, Jos. T., & Son, Inc., Chicago.

ROOFING AND SIDING—(Genuine Open Hearth Iron)
Newport (Ky.) Rolling Mill Co.

ROOFING AND SIDING—Iron and Steel
Newport (Ky.) Rolling Mill Co.

ROOFING & SIDING—(Zinc) Corrugated & Plain
New Jersey Zinc Sales Co., Inc., 160 Front St., N. Y. C.

ROPE—Power Transmission
Allis-Chalmers Mfg. Co., Milwaukee.

RUST PREVENTIVES
American Chemical Paint Co., Ambler, Pa.

RUST REMOVING
American Chemical Paint Co., Ambler, Pa.

SAFETY DEVICES & SUPPLIES
Weldit Acetylene Co., Detroit.

SAND—Core
Industrial Silica Corp., Youngstown, Ohio.

SAND—Furnace Bottom
Industrial Silica Corp., Youngstown, Ohio.

SAND—Molding
Rogers Brown & Crocker Bros., Inc., 21 E. 40th St., N. Y. C.

SAND—Sand Blast
Cape May (N. J.) Sand Co.
Industrial Silica Corp., Youngstown, Ohio.

SAND—Steel Molding
Cape May (N. J.) Sand Co.
Industrial Silica Corp., Youngstown, Ohio.

SAND BLAST EQUIPMENT AND MACHINES
Amer. Fdry. Equip. Co., Mishawaka, Ind.
Arcade Mfg. Co., Freeport, Ill.
Mott Sand Blast Mfg. Co., Inc., Chi.
Pangborn Corp., Hagerstown, Md.
Sly, W. W., Mfg. Co., Cleveland, O.

SAND CUTTING AND SCREENING MACHINES
Amer. Fdry. Equip. Co., Mishawaka, Ind.
Bartlett, C. O. & Snow Co., Cleve.

SAND HANDLING EQUIPMENT
Bartlett, C. O. & Snow Co., Cleve.
Beardsley & Piper Co., Chicago, Ill.
Hayward Co., 50 Church St., N. Y. C.
National Engineering Co., Chicago.
Osborn Mfg. Co., The, Cleveland.

SAND MILLS
Bartlett, C. O. & Snow Co., Cleve.
National Engineering Co., Chicago.

SAND RAMMERS
Chicago Pneumatic Tool Co., 6 East 44th St., N. Y. C.

SAWING MACHINES—Metal
Atkins, E. C., & Co., Indianapolis, Ind.
Cochrane-Bly Co., Rochester, N. Y.
Earle Gear & Mch. Co., Phila.
Espen-Lucas Mach. Works, Phila.
Peerless Machine Co., Racine, Wis.
Racine Tool & Mch. Co., 1755 State St., Racine, Wis.

SAWS—Band and Hack for Metal
Armstrong-Blum Mfg. Co., Chicago.
Atkins, E. C., & Co., Indianapolis, Ind.
Disston, Henry, & Sons, Inc., Phila.
Simonds Saw & Steel Co., Fitchburg, Mass.

SAWS—Circular, Rip and Cutoff
Atkins, E. C., & Co., Indianapolis, Ind.
Cochrane-Bly Co., Rochester, N. Y.

SAWS—Cold Metal
Atkins, E. C., & Co., Indianapolis, Ind.

SAWS—Friction
Atkins, E. C., & Co., Indianapolis, Ind.
Ryerson, Jos. T., & Son, Inc., Chicago.

SAWS—Hack Saw Blades
Atkins, E. C., & Co., Indianapolis, Ind.
Darwin & Milner, Inc., Cleveland.
Peerless Mch. Co., Racine, Wis.

SAWS—Hot Metal
Atkins, E. C., & Co., Indianapolis, Ind.

SAWS—Inserted Tooth, Cold
Disston, Henry, & Sons, Inc., Phila.
Simonds Saw & Steel Co., Fitchburg, Mass.

SAWS—Milling
Disston, Henry & Sons, Inc., Phila.

SAWS—Screw Slotting
Atkins, E. C., & Co., Indianapolis, Ind.

SAWS—Sliding Frame
United Engrg. & Fdry. Co., Ptgh.

SCRAP—Iron and Steel
Luria Bros. & Co., Inc., Woolworth Bldg., N. Y. C.
Perry, Buxton, Doane Co., Boston.
Potts, Henry, & Co., Phila.

SCREENS—Perforated Metal
Chicago Perforating Co., Chicago, Ill.
Cross Engineering Co., Carbondale, Pa.
Erdle Perforating Co., Rochester, N. Y.
Harrington & King Perforating Co., Chi.
Hendrick Mfg. Co., Carbondale, Pa.
Mundt, Chas., & Sons, Jersey City, N. J.

SCREENS—Vibrating
Link-Belt Co., Chicago.

SCREENS—Woven Wire
Cleveland (O.) Wire Cloth & Mfg. Co.
Manganese Steel Forge Co., Phila.
Michigan Wire Cloth Co., 2117 Howard St., Detroit
Wickwire Spencer Steel Co., 41 E. 42nd, N. Y. C.

SCREW MACHINE PRODUCTS
Barnes, Wallace, Co., The, Bristol, Ct.
Bell, David, Co., Inc., The, Buffalo, N. Y.
Cleveland (O.) Cap Screw Co., The.
Corbin Screw Corp., New Britain, Ct.
Eastern Mch. Screw Corp., New Haven, Ct.
Hartford (Ct.) Machine Screw Co.
Luers Bros. Mchry. & Tool Co., Detroit, Mich.
National Acme Co., The, Cleveland.
Newton Mfg Co, Plainville, Ct.
Olson Mfg. Co., Worcester, Mass.
Ottemiller, Wm. H., Co., Inc., York, Pa.
Penn Screw & Machine Works, Phila.
Progressive Mfg. Co., Torrington, Ct.
Screw Mch. Products Corp., Prov., R. I.
Shimer, Samuel J., & Sons, Inc., Milton, Pa.
Western Screw Products Co., St. Louis, Mo.

SCREW MACHINERY—Automatic
Cone Automatic Mach. Co., Inc., Windsor, Vt.
National Acme Co., The, Cleveland.

SCREW MACHINERY—Automatic Wood
Cook, Asa S., Co., Hartford, Ct.

SCREW MACHINERY—Hand
Jones & Lamson Mch. Co., Springfield, Vt.

SCREW MACHINERY—Multiple Spindle
Acme Mch. Tool Co., Cincinnati.
Cone Automatic Mach. Co., Inc., Windsor, Vt.
National Acme Co., The, Cleveland.

SCREWS—CAP
Clark Bros. Bolt Co., Milldale, Conn.
Cleveland (O.) Cap Screw Co.
Corbin Screw Corp., New Britain, Ct.
National Acme Co., The, Cleveland.
Ottemiller, Wm. H., Co., Inc., York, Pa.
Reed & Prince Mfg. Co., Worcester, Mass.
Shimer, Samuel J., & Sons, Inc., Milton, Pa.
Western Screw Products Co., St. Louis, Mo.

SCREWS—Coach or Lag
Lamson & Sessions Co., The, Cleveland, O.

SCREWS—Cold Headed
Cleveland (O.) Cap Screw Co., The.

SCREWS—Machine
Corbin Screw Corp., New Britain, Ct.
Progressive Mfg. Co., Torrington, Ct.
Reed & Prince Mfg. Co., Worcester, Mass.

SCREWS—Safety Set
Allen Mfg. Co., The, Hartford, Ct.
Bristol Co., Waterbury, Ct.
Progressive Mfg. Co., Torrington, Ct.
Standard Pressed Steel Co., Jenkintown, Pa.
Strong, Carlisle & Hammond Co., Cleve.

SCREWS—Set
National Acme Co., The, Cleveland.
Ottemiller, Wm. H., Co., Inc., York, Pa.
Reed & Prince Mfg. Co., Worcester, Mass.
Strong, Carlisle & Hammond Co., Cleve.

SCREWS, Socket, Head, Cap.
Allen Mfg. Co., The, Hartford, Ct.
Standard Pressed Steel Co., Jenkintown, Pa.
Strong, Carlisle & Hammond Co., The, Cleveland.

SCREWS—Thumb Malleable
Philadelphia (Pa.) Hardware & Malleable Iron Wks., Inc.

SCREWS—Wood
Corbin Screw Corp., New Britain, Ct.
Reed & Prince Mfg. Co., Worcester, Mass.

SCYTHE STONES & WHETSTONES
Carborundum Co., The, Niagara Falls, N. Y.

SECOND-HAND MACHINERY — See Clearing House Section
Acme Equip. Co., Inc., Detroit, Mich.
Adams, Ogden R., Rochester, N. Y.
Armel, James P., Ptgh.
Beatty Mch. & Mfg. Co., Hammond, Ind.
Bennett Mchry. Co., 30 Church st., New York City.
Botwinik Bros., Inc., New Haven, Ct.
Brandt Mchry. Co., Pittsburgh, Pa.
Craig, Thomas H., Jr., Bridgeport, Conn.
Davis, Robert Warren, Detroit, Mich.
Denny, W. I., Chicago, Ill.
Eastern Mchry. Co., Cincinnati.
Easley, E. L., Mchry. Co., Chicago.
Firm Purchasing Corp., 1 Hanson Place, Brooklyn, N. Y.
Harris Bros. Co., Chicago.
Highway Truck Parts Co., Indianapolis, Ind.
Hill, Clarke & Co. of Chicago, 647 W. Washington Blvd., Chicago, Ill.
Hitner's, Henry A., Sons Co., Phila., Pa.
Ideal Machinery Co., Plainville, Ct.
Industrial Plants Corp., 25 Church, New York, N. Y.
International Mchry Co., Detroit.
Johnson, Wm. C., & Sons, Mchry. Co., St. Louis, Mo.
Llewelyn, Thomas J., & Co., Ptgh.
Lodge & Shipley Mch. Tool Co., Cinci.
Love, A. C., Co., Huntington, W. Va.
Lucas, J. L., & Son, Inc., Bridgeport, Conn.
MacCabe, T. B., Phila.
Marr-Galbreath Mchry. Co., Ptgh.
Miles Mchry. Co., Saginaw, W. S., Mich.
Morey & Co., Inc., 410 Broome St., N. Y. C.
New Jersey Mchry. Exchg., Inc., Newark, N. J.
Nilson, A. H., Mach. Co., Bridgeport, Ct.
Norris Brothers, Inc., Robinson, Ill.
O'Brien Machry. Co., Phila.
Osborne & Sexton Mchry. Co., Columbus, O.
Penn Mchry. Co., Philadelphia.
Price, Harry D., Renfrew, Pa.
Randle Mchry. Co., 1772 Powers St., Cinn.
Reliance Mchry. Sales Co., Ptgh.
Rentschler, J. P., & Co., Chicago, Ill.
Ross Power Equip. Co., Indianapolis.
Russell Mch. Co., Ptgh.
Ryerson, Jos. T., & Son, Inc., Chicago.
Scully-Jones & Co., Chicago.
Seifreat-Elstad Mchry. Co., Dayton, O.
Shaw & Lynch, Inc., Philadelphia, Pa.
Simmons Mach. Tool Corp., Albany, N. Y.
Tippins & Sprengle, Inc., Pittsburgh, Pa.
Walsh, J. T., Buffalo, N. Y.
White, A. D. Machry. Co., Chicago.
Zelnicker in St. Louis, Mo.

SEPARATORS—Gas
Research Corp., 25 West 43rd St., N. Y. C.

SEPARATORS—Magnetic
Dings Magnetic Separator Co., Milwaukee.
Magnetic Mfg. Co., Milwaukee.
Ohio Electric & Mfg. Co., Cleve.

SEPARATORS—Oil
Ransohoff, N., Inc., Cinn., Ohio.

SHAFTING—Cold Drawn
Bethlehem (Pa.) Steel Co.
Cumberland (Md.) Steel Co.
Ryerson, Jos. T., & Son, Inc., Chicago.

SHAFTING—Smooth Forged or Rough Turned
Erie (Pa.) Forge Co.

SHAFTING—Steel
Bliss & Laughlin, Inc., Harvey, Ill.
Cumberland (Md.) Steel Co.

ALL THESE COMPANIES CARRY AN AD IN THIS ISSUE
ALPHABETICAL INDEX . . . . PAGES 240-242

SHAFTING—Tubular Material For
National Tube Co., Pittsburgh.

SHAFTING—Turned and Polished
Cumberland (Md.) Steel Co.
Jones & Laughlin Steel Corp., Pgh.
Medart Co., The, St. Louis, Mo.
Moltrup Steel Products Co., Beaver Falls, Pa.

SHAFTS—Flanged, Upset Forged
American Forge Co., 2621 S. Hoyne Ave., Chicago.

SHAPES—Steel
Phoenix Iron Co., Phila.
Ryerson, Jos. T., & Son, Inc., Chicago.

SHAPING MACHINES—Horizontal
American Tool Works Co., Cinci.
Cincinnati (O.) Shaper Co., The.
Crescent Machine Co., Leetonia, O.
Gould & Eberhardt, Newark, N. J.
Hendey Mch. Co., Torrington, Ct.
Ryerson, Jos. T., & Son, Inc., Chicago
Smith & Mills Co., Cinci.

SHEAR BLADES AND KNIVES
Atkins, E. C., & Co., Indianapolis, Ind.
Heppenstall Co., Pittsburgh.
Marshalltown (Iowa) Mfg. Co.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Wapakoneta (O.) Machine Co.
Yoder Co., The, Cleveland.

SHEARING MACHINES—Alligator
Canton (O.) Fdry. & Mch. Co.
Doelger & Kirsten, 3105 Chambers St., Mil.
Hendley & Whittemore Co., Beloit, Wis.
Long & Allstatter Co., Hamilton, O.
Newbold, R. S., & Son Co., Norristown, Pa.
Pels, Henry, & Co., 90 West St., N. Y. C.
Smith, David H., & Sons, Inc., Foot of 51st St., B'klyn, N. Y.
United Engrg. & Fdry. Co., Pgh.

SHEARING MACHINES—Angle, Hand and Power
Cleveland (O.) Punch & Shear Wks. Co.
Pels, Henry, & Co., 90 West St., N. Y. C.
Smith, David H., & Sons, Inc., Foot of 51st St., B'klyn, N. Y.
Thomas Spacing Mach. Co., Pgh., Pa.

SHEARING MACHINES — Automatic Alligator
Doelger & Kirsten, 3105 Chambers St., Mil.

SHEARING MACHINES—Bar
Aetna-Standard Eng. Co., Youngstown, O.
Beatty Mch. & Mfg. Co., Hammond, Ind.
Buffalo (N. Y.) Forge Co., 492 B'way
Cleveland (O.) Punch & Shear Wks. Co.
Long & Allstatter Co., Hamilton, O.
Newbold, R. S., & Son Co., Norristown, Pa.
Pels, Henry, & Co., 90 West St., N. Y. C.
Smith, David H., & Sons, Inc., Ft. of 51st St., Brooklyn, N. Y.

SHEARING MACHINES — Beam and Channel
Cleveland (O.) Punch & Shear Wks. Co.
Pels, Henry, & Co., 90 West St., N. Y. C.
Smith, David H., & Sons, Inc., Foot of 51st St., B'klyn, N. Y.

SHEARING MACHINES—Billet
Morgan Engineering Co., Alliance, O.
Pels, Henry & Co., 90 West St., N. Y. C.
Smith, David H., & Sons, Inc., Foot of 51st St., B'klyn, N. Y.
United Engrg. & Fdry. Co., Pgh.

SHEARING MACHINES — Continuous Automatic
Yoder Co., The, Cleveland.

SHEARING MACHINES — Continuous Sheet & Pack
Streine Tool & Mfg. Co., New Bremen, O.

SHEARING MACHINES—Doubling and Squaring
United Engrg. & Fdry. Co., Pgh.

SHEARING MACHINES — Metal Slitting
Buffalo (N. Y.) Forge Co., 492 B'way.
Hendley & Whittemore Co., Beloit, Wis.
Pels, Henry, & Co., 90 West St., N. Y. C.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Smith, David H., & Sons, Inc., Foot of 51st St., B'klyn, N. Y.

SHEARING MACHINES — Metal Slitting Gang
Adriance Mach. Works, Inc., 82 Richards St., Bklyn, N. Y.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Yoder Co., The, Cleveland.

SHEARING MACHINES—Plate
Bertsch & Co., Cambridge City, Ind.
Cleveland (O.) Punch & Shear Wks. Co.
Dreis & Krump Mfg. Co., Chicago.
Long & Allstatter Co., Hamilton, O.
Marshalltown (Iowa) Mfg. Co.
Morgan Engineering Co., Alliance, O.
Newbold, R. S., & Son Co., Norristown, Pa.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Pels, Henry, & Co., 90 West St., N. Y. C.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Ryerson, Jos. T., & Son, Inc., Chicago.
Smith, David H., & Sons, Inc., Foot of 51st St., B'klyn, N. Y.
Thomas Spacing Mach. Co., Pgh., Pa.
United Engrg. & Fdry. Co., Pgh.
Wood, R. D., & Co., Philadelphia.
Yoder Co., The, Cleveland.

SHEARING MACHINES—Rotary for Irregular Cutting
Newbold, R. S., & Son Co., Norristown, Pa.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Ryerson, Jos. T., & Son, Inc., Chicago.
Yoder Co., The, Cleveland.

SHEARING MACHINES — Rotary Slitting Gang
Streine Tool & Mfg. Co., New Bremen, O.
Yoder Co., The, Cleveland.

SHEARING MACHINES — Sheet and Plate
Dreis & Krump Mfg. Co., Chicago.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner), St. Marys, O.
Streine Tool & Mfg. Co., New Bremen, O.
Yoder Co., The, Cleveland.

SHEARING MACHINES—Squaring
Dreis & Krump Mfg. Co., Chicago.
Streine Tool & Mfg. Co., New Bremen, O.
Toledo (O.) Mch. & Tool Co.

SHEET BARS
Andrews Steel Co., Newport, Ky.

SHEET METAL MACHINERY
Adriance Machine Wks., Inc., 82 Richards St., Bklyn, N. Y.
Bliss, E. W. Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Cincinnati (O.) Shaper Co., The.
Consolidated Mch. Tool Corp. of America, Rochester, N. Y.
Dreis & Krump Mfg. Co., Chicago.
Excelsior Tool & Mch. Co., East St. Louis, Ill.
Ferracute Machine Co., Bridgeton, N. J.
Kane & Roach, Syracuse, N. Y.
Loy & Nawrath Div. Farrel-Birmingham Co., Inc., Derby, Conn.
Newbold, R. S., & Son Co., Norristown, Pa.
New Albany (Ind.) Mch. Mfg. Co.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Ohl, George A., & Co., Inc., Newark, N. J.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Streine Tool & Mfg. Co., New Bremen, O.
Standard Machinery Co., Auburn, R. I.
Toledo (O.) Machine & Tool Co.
V & O Press Co., Hudson, N. Y.
Verdin, Kappes & Verdin Co., Cinn.
Yoder Co., The, Cleveland.

SHEET METAL WORK
Kelker Blower Co., Inc., Buffalo, N. Y.

SHEETS—Aluminum
Erdle Perforating Co., Rochester, N. Y.

SHEETS—Auto Body
Central Alloy Steel Corp., Massillon, O.
Eastern Rolling Mill Co., Balto., Md.
Empire Steel Corp., Mansfield, Ohio.
Newport (Ky.) Rolling Mill Co.
Newton Steel Co., Youngstown, Ohio.

SHEETS—Black
Bethlehem (Pa.) Steel Company.
Central Alloy Steel Corp., Massillon, O.
Empire Steel Corp., Mansfield, Ohio.
Inland Steel Co., Chicago.
Newport (Ky.) Rolling Mill Co.
Republic Iron & Steel Co., Youngstown, O.
Ryerson, Jos. T., & Son, Inc., Chicago.
Weirton (W. Va.) Steel Co.

SHEETS—Blue Annealed
Alan Wood Steel Co., Conshohocken, Pa.
Bethlehem (Pa.) Steel Co.
Central Alloy Steel Corp., Massillon, O.
Central Iron & Steel Co., Harrisburg, Pa.
Empire Steel Corp., Mansfield, Ohio.
Inland Steel Co., Chicago.
Newport (Ky.) Rolling Mill Co.
Ryerson, Jos. T., & Son, Inc., Chicago.

SHEETS—Box Annealed
Empire Steel Corp., Mansfield, Ohio.
Newport (Ky.) Rolling Mill Co.

SHEETS—Brass, Bronze, Copper, Nickel Silver or Phosphor Bronze
Phosphor Bronze Smelting Co., Phila.
Seymour (Ct.) Mfg. Co.

SHEETS—Copper Steel
Inland Steel Co., Chicago.
Newport (Ky.) Rolling Mill Co.

SHEETS—Electrical
Allegheny Steel Co., Brackenridge, Pa.
Central Alloy Steel Corp., Massillon, O.
Empire Steel Corp., Mansfield, Ohio.
Newport (Ky.) Rolling Mill Co.

SHEETS—Enameling Stock.
Empire Steel Corp., Mansfield, Ohio.

SHEETS — Enameling Stock (Genuine Open Hearth Iron)
Newport (Ky.) Rolling Mill Co.

SHEETS—For Drawing and Stamping
Allegheny Steel Co., Brackenridge, Pa.
Central Alloy Steel Corp., Massillon, O.
Eastern Rolling Mill Co., Balto., Md.
Empire Steel Corp., Mansfield, Ohio.
Firth-Sterling Steel Co., McKeesport, Pa.
Newport (Ky.) Rolling Mill Co.
Newton Steel Co., Youngstown, Ohio.
Wheeling (W. Va.) Steel Corp.

SHEETS—Full Finished
Central Alloy Steel Corp., Massillon, O.
Eastern Rolling Mill Co., Balto., Md.
Empire Steel Corp., Mansfield, Ohio.
Newport (Ky.) Rolling Mill Co.
Newton Steel Co., Youngstown, Ohio.
Seneca Iron & Steel Co., Buffalo, N. Y.

SHEETS—Galvanized, Flat and Corrugated
Bethlehem (Pa.) Steel Co.
Empire Steel Corp., Mansfield, Ohio.
Inland Steel Co., Chicago.
Newport (Ky.) Rolling Mill Co.
Republic Iron & Steel Co., Youngstown, O.
Ryerson, Jos. T., & Son, Inc., Chicago.
Weirton (W. Va.) Steel Co.

SHEETS—Locomotive Jacket
Newport (Ky.) Rolling Mill Co.

SHEETS—Metal Furniture
Allegheny Steel Co., Brackenridge, Pa.
Central Alloy Steel Corp., Massillon, O.
Eastern Rolling Mill Co., Balto., Md.
Empire Steel Corp., Mansfield, Ohio.
Newport (Ky.) Rolling Mill Co.
Seneca Iron & Steel Co., Buffalo, N. Y.

SHEETS—Pickled
Newport (Ky.) Rolling Mill Co.

SHEETS—Stove Pipe Blue
Empire Steel Corp., Mansfield, Ohio.

SHEETS—Tin Mill Black
Empire Steel Corp., Mansfield, Ohio.

SHEETS—Zinc
New Jersey Zinc Sales Co., Inc., 160 Front St., N. Y. C.

SHELLS—Brass and Copper
Bridgeport (Conn.) Brass Co.

SHELVING—Steel
Cleveland (O.) Wire Spring Co.

SHINGLES—Metal
Newport (Ky.) Rolling Mill Co.

SHIP BUILDERS' MATERIAL
Bethlehem (Pa.) Steel Co.

SHOES—Horse & Mule
Burden Iron Co., The, Troy, N. Y.

SKIDS—Lift Truck
Lewis-Shepard Co., 122 Walnut St., Watertown Station, Boston.

SLABS
Andrews Steel Co., Newport, Ky.

SLINGS—Wire Rope
Roebling's, John A., Sons Co., Trenton, N.J.

SLOTTING MACHINES
Consolidated Mch. Tool Corp. of America, Rochester, N. Y.
Nazel Engrg. & Mch. Wks., Phila.

SPACING TABLES—Punching & Shearing
Thomas Spacing Mach. Co., Pgh., Pa.

SPECIAL MACHINERY
Bethlehem (Pa.) Steel Co.
Bullard Co., The, Bridgeport, Ct.
Clingerman, G. F., Mfg. Co., Bellefontaine, Ohio.
Coon, Asa S., Co., Hartford, Ct.
Cowdrey, C. H., Machine Co., 30 Summer St., Fitchburg, Mass.
Hartford (Ct.) Special Mchry. Co.
Hill Clutch Machine & Foundry Co., Cleveland, O.
Jones Mch. Tool Wks., Inc., Phila., Pa.
Langelier Mfg. Co., Providence, R. I.
Littell, F. J., Mch. Co., Chicago.
Manville, E. J., Mach. Co., Waterbury, Ct.
Morgan Engineering Co., Alliance, O.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Treadwell Engineering Co., Easton, Pa.
Verdin, Kappes & Verdin Co., Cinn.
Whiting Corp., Harvey, Ill.
Yoder Co., The, Cleveland.

SPEED REDUCERS
Boston Gear Wks. Sales Co., Norfolk Downs, Mass.
Cleveland (O.) Worm & Gear Co.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.
Link-Belt Co., Chicago.
Philadelphia (Pa.) Gear Works.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

SPIKES
Ames, W., & Co., Jersey City, N. J.
Bethlehem (Pa.) Steel Co.
Inland Steel Co., Chicago.
Oliver Iron & Steel Corp., Pgh.
Wrought Iron Co. of America, Lebanon, Pa.

SPRING MAKING MACHINERY
Baird Machine Co., Bridgeport, Ct.
Sleeper & Hartley, Inc., Worcester, Mass.

SPRINGS—Car
Amer. Spiral Spring & Mfg. Co., Pgh.
Miller & Van Winkle, Inc., 18 Bridge St., Bklyn, N. Y.

SPRINGS—Wire, Coil or Flat
Airplane Spring Co., 30 Main St., Brooklyn, N. Y.
American Spiral Spring & Mfg. Co., Pgh.
Amer. Spring & Mfg. Corp., Holley, Mich.
Barnes-Gibson-Raymond, Inc., Detroit.
Barnes, Wallace, Co., The, Bristol, Ct.
Cleveland (O.) Wire Spring Co.
Cook Spring Div. of Barnes-Gibson-Raymond, Inc., Ann Arbor, Mich.
Cuyahoga Spring Co., Cleve.
Dunbar Bros. Co., Bristol, Ct.
Fischer, Chas., Spring Co., 242 Kent Ave., Bklyn, N. Y.
Gibson, Wm. D., Co., Chicago.
Hubbard, M. D., Spring Co., Pontiac, Mich.
Hunter Pressed Steel Co., Lansdale, Pa.
Lee Spring Co., Inc., 30 Main St., Bklyn., N. Y.
Miller & Van Winkle, Inc., 18 Bridge St., Bklyn, N. Y.
Raymond Mfg. Co., Corry, Pa.
Washburn Wire Co., Inc., 118th St. & Harlem River, N. Y. C.
Wickwire Spencer Steel Co., 41 E. 42nd St., N. Y. C.

SPROCKETS
Boston Gear Works Sales Co., Norfolk Downs, Mass.
Dundore Mfg. Co., Reading, Pa.
Link-Belt Co., Chicago.
Whitney Mfg. Co., Hartford, Ct.

STACKS—Steel
Chicago (Ill.) Bridge & Iron Wks.
Meehan Boiler & Construction Co., Lowellville, Ohio.
Muskegon (Mich.) Boiler Works

STAMPINGS OR DRAWINGS—Metal
Acme Stpg. & Mfg. Co., Pittsburgh.
Akron-Selle Co., Akron, Ohio.
Amer. Forging & Socket Co., Pontiac, Mich
American Pulley Co., Philadelphia.
Amer. Spring & Mfg. Corp., Holley, Mich.
American Tube & Stpg. Plant (The Stanley Wks.), Bridgeport, Conn.
Barnes-Gibson-Raymond, Inc., Detroit.
Barnes, Wallace, Co., The, Bristol, Ct.
Behringer, E., Sheet Metal Wks., Inc., Newark, N. J.
Bossert Corp., The, Utica, N. Y.
Box D 2, West Side P. O., Youngstown, Ohio.
Breese Bros. Co., Cincinnati.
Bridgeport (Conn.) Brass Co.
Cleveland (O.) Hardware Co.
Burgess-Norton Mfg. Co., Geneva, Ill.
Coes, H. C., Co., Ansonia, Ct.
Cook Spring Div. of Barnes-Gibson-Raymond, Inc., Ann Arbor, Mich.
Cuyahoga Spring Co., Cleveland.
Davis Brake Beam Co., Johnstown, Pa.
Detroit (Mich.) Metal Specialty Corp.
Eastern Tool & Stpg. Co., Inc., Saugus, Mass.
Erdle Perforating Co., Rochester, N. Y.
Fischer, Chas., Spring Co., 242 Kent Ave., Brooklyn, N. Y.
General Mach. & Mfg. Co., Bridgeport, Ct.
Geuder, Paeschke & Frey Co. (Contract Mfg. Div.), Milwaukee.
Globe Mach. & Stpg. Co., Cleve.
Great Lakes Pressed Steel Corp., Buffalo, N. Y.
Hagar, C., & Sons Hinge Mfg. Co., St. Louis, Mo.
Hubbard, M. D., Spring Co., Pontiac, Mich.
Huebel Mfg. Co., Inc., Newark, N. J.
Hunter Pressed Steel Co., Lansdale, Pa.
Keystone Friction Hinge Co., Williamsport, Pa.
Konigslow, Otto, Mfg. Co., Cleve.
Lansing (Mich.) Stpg. Co.
Matthews Mfg. Co., Worcester, Mass.
Metal Specialty Co., Cincinnati.
Miller & Van Winkle, Inc., 18 Bridge St., Bklyn., N. Y.
Mullins Mfg. Corp., Salem, Ohio.
New England Pressed Steel Co., 1 Washington Ave., Natick, Mass.
Parish Pressed Steel Co., Reading, Pa.
Patent Specialty Supply Co., Cambridge, N. Y.
Penn Jersey Metal Products Corp., Camden, N. J.
Pressed & Welded Steel Prods. Co., Long Island City, N. Y.
Rockford (Ill.) Iron Wks.
St. Paul (Minn) Corrugating Co.
Schollhorn, Wm. Co., The, New Haven, Conn.
Seymour (Ct.) Products Co., The.
Smith, Thomas, Co., 286 Grove St., Worcester, Mass.
Stanley Works, The, New Britain, Ct.
Torrington (Ct.) Co.
Truscon Steel Co., Pressed Steel Div., Cleveland.
Vocder-Root, Inc., Hartford, Ct.
Welker-Hoops Mfg. Co., Middletown, Conn.
Wilkoff, Wm., Inc., Niles, O.
Worcester (Mass.) Pressed Steel Co.
Worcester (Mass.) Stamped Metal Co.
York (Pa.) Corrugating Co.

STAMPS—Steel Alphabets and Figures
Noble & Westbrook Mfg. Co., Hartford, Ct.
Schwerdtle Stamp Co., Bridgeport, Ct.

STARTERS—Electric Motor
Square D Co., Detroit.

STAYBOLTS
Oliver Iron & Steel Corp., Pgh.

STEEL—Alloy
Alan Wood Steel Co., Conshohocken, Pa.
Allen, Edgar, Steel Co., Inc., 745 Washington St., N. Y. C.
Andrews Steel Co., The, Newport, Ky.
Bethlehem (Pa.) Steel Co.
Central Alloy Steel Corp., Massillon, O.
Donner Steel Co., Inc., Buffalo, N. Y.
Driver-Harris Co., Harrison, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Hawkridge Bros. Co., Boston.
Heller Bros. Co., Newark, N. J.
Heppenstall Co., Pittsburgh.
Interstate Iron & Steel Co., Chicago, Ill.
Jessop Steel Co., Washington, Pa.
Latrobe (Pa.) Electric Steel Co.
Ryerson, Jos. T., & Son, Inc., Chicago.
Timken Roller Bearing Co., Canton, Ohio.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

ALL THESE COMPANIES CARRY AN AD IN THIS ISSUE
ALPHABETICAL INDEX . . . . PAGES 240-242

STEEL—Alloy, Cold Drawn
Moltrup Steel Products Co., Beaver Falls, Pa.

STEEL—Carbon
Andrews Steel Co., The, Newport, Ky.
Carnegie Steel Co., Pittsburgh.
Donner Steel Co., Inc., Buffalo, N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Latrobe (Pa.) Electric Steel Co.

STEEL—Carbon Vanadium
Andrews Steel Co., The, Newport, Ky.
Latrobe (Pa.) Electric Steel Co.

STEEL—Chrome
Andrews Steel Co., The, Newport, Ky.
Central Alloy Steel Corp., Massillon, O.
Donner Steel Co., Inc., Buffalo, N. Y.
Latrobe (Pa.) Electric Steel Co.

STEEL—Chrome Manganese
Latrobe (Pa.) Electric Steel Co.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL—Chrome Nickel
Andrews Steel Co., Newport, Ky.
Central Alloy Steel Corp., Massillon, O.
Donner Steel Co., Inc., Buffalo, N. Y.
Latrobe (Pa.) Electric Steel Co.

STEEL—Chrome Vanadium
Andrews Steel Co., Newport, Ky.
Central Alloy Steel Corp., Massillon, O.
Donner Steel Co., Inc., Buffalo, N. Y.
Latrobe (Pa.) Electric Steel Co.

STEEL—Cobalt
Darwin & Milner, Inc., Cleveland.

STEEL—Cold Drawn
Bethlehem (Pa.) Steel Co.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Globe Wire Company, Div. of the Firth-Sterling Steel Co., Sharpsburg, Pa.
Latrobe (Pa.) Electric Steel Co.
Moltrup Steel Prods. Co., Beaver Falls, Pa.
Pittsburgh Tool Steel Wire Co., Monaca, Pa.
Rathbone, A. B. & J., Palmer, Mass.
Wetherell Bros. Co., Cambridge, 39, Mass.

STEEL—Cold Rolled Strips
Acme Steel Co., Chicago.
American Tube & Stpg. Plant (The Stanley Wks.), Bridgeport, Conn.
Athenia Steel Co., 135 William St., N. Y.
Cold Metal Process Co., Youngstown, Ohio.
Griffin Mfg. Co., Erie, Pa.
Latrobe (Pa.) Electric Steel Co.
Stanley Works, The, New Britain, Ct.
Superior Steel Corp., Union Trust Bldg., Pitgh.
Washburn Wire Co., Inc., 118th St. & Harlem River, N. Y. C.
Weirton (W. Va.) Steel Co.
West Leechburg Steel Co., Pitgh.
Wetherell Bros. Co., Cambridge, 39, Mass.
Wickwire Spencer Steel Co., 41 E. 42nd, N. Y. C.
Worcester (Mass.) Pressed Steel Co.

STEEL—Crucible
Columbia Tool Steel Co., Chicago Hgts., Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Jessop Steel Co., Washington, Pa.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Cutlery
Firth-Sterling Steel Co., McKeesport, Pa.
Jessop Steel Co., Washington, Pa.
Latrobe (Pa.) Electric Steel Co.
Wetherell Bros. Co., Cambridge, 39, Mass.

STEEL—Die
Andrews Steel Co., The, Newport, Ky.
Bethlehem (Pa.) Steel Company.
Central Alloy Steel Corp., Massillon, O.
Disston, Henry, & Sons, Inc., Phila.
Firth-Sterling Steel Co., McKeesport, Pa.
Heppenstall Co., Pittsburgh.
Latrobe (Pa.) Electric Steel Co.

STEEL—Drill
Heller Bros. Co., Newark, N. J.
Latrobe (Pa.) Electric Steel Co.

STEEL—Electric
Disston, Henry, & Sons, Inc., Phila.
Donner Steel Co., Inc., Buffalo, N. Y.
Driver-Harris Co., Harrison, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Hawkridge Bros. Co., Boston.
Latrobe (Pa.) Electric Steel Co.
Timken Roller Bearing Co., Canton, O.

STEEL—High Speed
Allen, Edgar, Steel Co., Inc., 745 Washington St., N. Y. C.
Columbia Tool Steel Co., Chicago Hgts., Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Hawkridge Bros. Co., Boston.
Heller Bros. Co., Newark, N. J.
Jessop Steel Co., Washington, Pa.
Latrobe (Pa.) Elec. Steel Co.
Ryerson, Jos. T., & Son, Inc., Chicago.
Simonds Saw & Steel Co., Lockport, N. Y.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL—Hot Rolled Strips
Acme Steel Co., Chicago.
American Tube & Stpg. Plant (The Stanley Wks.), Bridgeport, Conn.
Barnes, Wallace, Co., The, Bristol, Ct.
Central Alloy Steel Corp., Massillon, O.
Griffin Mfg. Co., Erie, Pa.
Laclede Steel Co., St. Louis, Mo.
Latrobe (Pa.) Elec. Steel Co.
Stanley Works, The, New Britain, Ct.
Superior Steel Corp., Union Trust Bldg., Pitgh.
West Leechburg Steel Co., Pitgh.

STEEL—Magnet
Latrobe (Pa.) Elec. Steel Co.
Simonds Saw & Steel Co., Lockport, N. Y.

STEEL—Manganese
Frog, Switch & Mfg. Co., The, Carlisle, Pa.

STEEL—Manganese Rolled or Forged
Manganese Steel Forge Co., Phila.

STEEL—Nickel
Andrews Steel Co., Newport, Ky.
Central Alloy Steel Corp., Massillon, O.
Donner Steel Co., Inc., Buffalo, N. Y.

STEEL—Open Hearth
Andrews Steel Co., The, Newport, Ky.
Donner Steel Co., Inc., Buffalo, N. Y.
Driver-Harris Co., Harrison, N. J.
Jones & Laughlin Steel Corp., Pitgh.
Timken Roller Bearing Co., Canton, O.

STEEL—Rustless
Firth-Sterling Steel Co., McKeesport, Pa
Latrobe (Pa.) Electric Steel Co.

STEEL—Screw
Jones & Laughlin Steel Corp., Pitgh.
Timken Roller Bearing Co., Canton, O.

STEEL—Special Analysis
Andrews Steel Co., The, Newport, Ky.
Central Alloy Steel Corp., Massillon, O.
Hawkridge Bros. Co., Boston.
Latrobe (Pa.) Electric Steel Co.
Timken Roller Bearing Co., Canton, O.
West Leechburg Steel Co., Pitgh.

STEEL—Spring
Athenia Steel Co., 135 William St., N. Y.
Barnes, Wallace, Co., The, Bristol, Ct.
Bethlehem (Pa.) Steel Co.
Central Alloy Steel Corp., Massillon, O.
Donner Steel Co., Inc., Buffalo, N. Y.
Hawkridge Bros. Co., Boston.
Ryerson, Jos. T., & Son, Inc., Chicago.
Timken Roller Bearing Co., Canton, O.

STEEL—Stainless
Babcock & Wilcox Tube Co., The, 85 Liberty St., N. Y. C.
Firth-Sterling Steel Co., McKeesport, Pa.
Hawkridge Bros. Co., Boston.
Latrobe (Pa.) Electric Steel Co.
Simonds Saw & Steel Co., Lockport, N. Y.

STEEL—Tool
Allen, Edgar, Steel Co., Inc., 745 Washington St., N. Y. C.
Bethlehem (Pa.) Steel Co.
Columbia Tool Steel Co., Chicago Hgts., Ill.
Darwin & Milner, Inc., Cleveland.
Disston, Henry, & Sons, Inc., Phila.
Firth-Sterling Steel Co., McKeesport, Pa.
Hawkridge Bros. Co., Boston.
Heller Bros. Co., Newark, N. J.
Jessop Steel Co., Washington, Pa.
Latrobe (Pa.) Electric Steel Co.
Milne, A., & Co., 745 Washington St., N. Y. C.
Ryerson, Jos. T., & Son, Inc., Chicago.
Simonds Saw & Steel Co., Lockport, N. Y.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wetherell Bros. Co., Cambridge 39, Mass.

STEEL—Tool, Special Shapes
Heller Bros. Co., Newark, N. J.
Latrobe (Pa.) Electric Steel Co.

STEEL—Vanadium
Andrews Steel Co., Newport, Ky.
Central Alloy Steel Corp., Massillon, O.
Latrobe (Pa.) Elec. Steel Co.

STEEL PLANTS AND ROLLING MILLS
McKee, Arthur G., & Co., Cleve.
Perin & Marshall, 11 West 42nd St., N. Y. C.

STEEL PLATE CONSTRUCTION
Chicago (Ill.) Bridge & Iron Wks.
Cole, R. D., Mfg. Co., Newnan, Ga.
Jones & Laughlin Steel Corp., Pitgh.
Lancaster (Pa.) Iron Works, Inc.
Meehan Boiler & Construction Co., Lowellville, Ohio.
Muskegon (Mich.) Boiler Wks.
Petroleum Iron Works Co., Sharon, Pa.
Steel Plate Products Co., Pottstown, Pa.

STEEL ROLLS
Heppenstall Co., Pittsburgh.

STEPS—Ladder & Stair, Safety
Blaw-Knox Co., Pitgh.

STEPS—Safety
Hendrick Mfg. Co., Carbondale, Pa.

STOCKS AND DIES
Jones & Lamson Mach. Co., Springfield, Vt.
Saunders', D., Sons, Yonkers, N. Y.

STOKERS
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.

STOKERS—Mechanical
Whiting Corp., Harvey, Ill.

STOOLS—Steel
Angle Steel Stool Co., Plainwell, Mich.
Vitek Mfg. Co., Omaha, Neb.

STOOLS—Steel, Adjustable
Vitek Mfg. Co., Omaha, Neb.

STOPPERS—Open-Hearth, Bessemer or Electric Furnace
McCullough-Dalzell Crucible Co., Pitgh.
Ross-Tacony Crucible Co., Phila.

STOVES—Hot Blast
Brassert, H. A., & Co., Chicago.

STRAIGHTENING AND CUTTING MACHINES—Strip (Automatic)
Hallden Mch. Co., Thomaston, Ct.

STRAIGHTENING MACHINES
Aetna-Standard Eng. Co., Youngstown, O.
Bliss, E. W., Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Kane & Roach, Syracuse, N. Y.
Medart Co., The, St. Louis, Mo.
Newbold, B. S., & Son Co., Norristown, Pa.
Pels, Henry, & Co., 90 West St., N. Y. C.
Thomas Spacing Mch. Co., Pitgh., Pa.

STRAIGHTENING MACHINES—Wire
Lewis Mch. Co., The, Cleveland, Ohio.
Shuster, F. B., Co., New Haven, Ct.

STRAIGHTENING AND SHEARING MACHINES—Rod, Gaggers
American Fdry. Equip. Co., Mishawaka, Ind.

STRUCTURAL IRON AND STEEL WORK
Austin Co., The, Cleveland.
Belmont Iron Wks., Phila.
Bethlehem (Pa.) Steel Co.
Morgan Engng. Co., Alliance, O.
Phoenix Iron Co., Phila.
Shoemaker Bridge Co., Pottstown, Pa.

STRUCTURAL STEEL — See Angles, Beams, Channels and Tees

STUDS
Oliver Iron & Steel Corp., Pitgh.

SUPERHEATERS
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.

SWAGING MACHINES
Etna Machine Co., The, Toledo.
Langelier Mfg. Co., Providence, R. I.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Standard Machinery Co., Auburn, R. I.
Torrington (Ct.) Co.

SWITCHES—Electric
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Square D Co., Detroit.

TACHOMETERS—Angular and Linear Velocity
Barbour-Stockwell Co., Cambridge, Mass.

TANKS—Compressed Air, Gas, Oil and Water
Air-Tight Steel Tank Co., Pitgh.
Caldwell, W. E., Co., 1940 Brook St., Louisville, Ky.
Kellogg, M. W., Co., The, 225 Bdway, N. Y. C.
Muskegon (Mich.) Boiler Wks.
Petroleum Iron Works Co., Sharon, Pa.
Scaife, Wm. B., & Sons Co., Pitgh.
Westinghouse Traction Brake Co., Wilmerding, Pa.

TANKS—Elevated Steel
Chicago (Ill.) Bridge & Iron Wks.
Cole, R. D., Mfg. Co., Newnan, Ga.

TANKS—Elevated Wood
Caldwell, W. E., Co., 1940 Brook St., Louisville, Ky.
Hauser-Stander Tank Co., Cincinnati.

TANKS—Gasoline & Oil
Chicago (Ill.) Bridge & Iron Wks.

TANKS—Iron and Steel
Caldwell, W. E., Co., 1940 Brook St., Louisville, Ky.
Chicago (Ill.) Bridge & Iron Wks.
Janney, Joseph A., Jr., Phila.
Kellogg, M. W., Co., The, 225 Bdway, N. Y. C.
Lancaster (Pa.) Iron Works, Inc.
Scaife, Wm. B., & Sons Co., Pitgh.
Steel Plate Products Co., Pottstown, Pa.

TANKS—Lead Lined
Gross Lead Burning & Coating Corp., Cleveland.

TANKS—Pickling
Hauser-Stander Tank Co., Cincinnati.
Woolford, G., Wood Tank Mfg. Co., Phila.

TANKS—Rubber Lined
Hauser-Stander Tank Co., Cincinnati.

TANKS—Seamless Steel
National Tube Co., Pittsburgh.
Truscon Steel Co., Pressed Steel Div., Cleveland.

TANKS—Water
Hauser-Stander Tank Co., Cincinnati.

TANKS—Welded
Air-Tight Steel Tank Co., Pitgh.
National Tube Co., Pittsburgh.
Scaife, Wm. B., & Sons Co., Pitgh.

TANKS—Wood
Caldwell, W. E., Co., 1940 Brook St., Louisville, Ky.
Hauser-Stander Tank Co., Cincinnati.
Woolford, G., Wood Tank Mfg. Co., Phila.

TAPER PINS
Buffalo (N. Y.) Mch. Exy Co.

TAPPING MACHINES
Baker Bros., Inc., Toledo.
Barnes Drill Co., Inc., Rockford, Ill.
Defiance (O.) Machine Works
Langelier Mfg. Co., Providence, R. I.

TAPPING MACHINES—Nuts
National Mchry. Co., Tiffin, Ohio.

TAPS—Collapsing
Geometric Tool Co., New Haven, Conn.
Murchey Mach. & Tool Co., 951 Porter St., Detroit.
National Acme Co., The, Cleve.

TAPS AND DIES
Brubaker, W. L., & Bros., Co., 50 Church St., N. Y. C.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Murchey Mch. & Tool Co., 951 Porter St., Detroit.
National Acme Co., The, Cleve.
Pipe Mchry. Co., Cleveland.

TAR DISTILLING PLANTS
Koppers Construction Co., The, Pitgh.

TEES—See Angles, Beams, Channels and Tees

TELEPHONE & TELEGRAPH LINE MATERIAL
Oliver Iron & Steel Corp., Pitgh.

TELEPHONES—Interior
Screw Machine Products Corp., Prov., R. I.

TESTING MACHINES—Materials
Southwark Fdry. & Mch. Co., Phila.

THERMOMETERS—Recording
Taylor Instrument Companies, Rochester, N. Y.

THREAD CUTTING TOOLS—See Dies, Taps, Screw Plates, etc.

THREAD ROLLING MACHINES
Nilson, A. H., Mach. Co., Bridgeport, Ct.
Waterbury (Ct.) Farrel Fdry. & Mch. Co.

THREADING MACHINES
Geometric Tool Co., New Haven, Conn.
National Mchry. Co., Tiffin, Ohio.

TIE PLATES
Inland Steel Co., Chicago.
Joliet (Ill.) Wrought Washer Co.

TIES—Creosoted
Century Wood Preserving Co., Pitgh.
Jennison-Wright Co., Toledo

TIES—Metal
Bethlehem (Pa.) Steel Co.

TILE—Cement Roofing
American Cement Tile Mfg. Co., 803 Oliver Bldg., Pitgh.
Federal Cement Tile Co., Chicago.

TIMBERS—Creosoted
Jennison-Wright Co., Toledo

TIN PLATE
Weirton (W. Va.) Steel Co.

TIN PLATE MACHINERY
Aetna-Standard Eng. Co., Youngstown, O.

TINNERS' TOOLS AND MACHINES
Niagara Mch. & Tool Wks., Buffalo, N. Y.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.

TONGS—Chain Pipe
Williams, J. H., & Co., Buffalo, N. Y.

TOOL BITS
Apex Tool Co., Inc., Bridgeport, Conn.

TOOL HOLDERS
Apex Tool Co., Inc., Bridgeport, Conn.
Armstrong Bros. Tool Co., Chicago.
Williams, J. H., & Co., Buffalo, N. Y.

TOOLS, JIGS, FIXTURES, ETC.
Swanson Mch. Co., Jamestown, N. Y.

TOOLS—Lathe
Armstrong Bros. Tool Co., Chicago.

TOOLS—Machinists'
Billings & Spencer Co., Hartford, Conn.

TOOLS—Slag Digging
Rivet Cutting Gun Co., Cinn.

TOOLS—Steam and Gas Fitters
Saunders', D., Sons, Yonkers, N. Y.

TOOLS—Tungsten Carbide
Firth-Sterling Steel Co., McKeesport, Pa.

TORCHES—Blow
Anthony Co., L. I. C., N. Y.
Hauck Mfg. Co., 128 10th St., Bklyn, N. Y.

TORCHES—Brazing, Cutting & Welding
Harris Calorific Co., Cleveland.
Oxweld Acetylene Co., 30 E. 42nd St., N. Y. C.

(ALL THESE COMPANIES CARRY AN AD IN THIS ISSUE
ALPHABETICAL INDEX . . . . PAGES 240-242)

TOWERS—Steel
Blaw-Knox Co., Ptgh.
Caldwell, W. E., Co., 1940 Brook St., Louisville, Ky.

TOWERS—Transmission
Blaw-Knox Co., Ptgh.

TOWERS—Water—See Tanks—Elevated Steel and Elevated Wood

TRACK—Industrial
Bethlehem (Pa.) Steel Co.

TRACK—Monorail
American MonoRail Co., The, Cleveland.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

TRACTORS AND TRAILERS—See Trucks, Tractors and Trailers—Industrial

TRAILERS—Industrial—See Trucks, Tractors and Trailers—Industrial

TRAMRAILS—Overhead Systems
Armington Engineering Co., Euclid, O.
Cleveland Electric Tramrail, Wickliffe, O.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

TRAMWAYS—Wire Rope
Broderick & Bascom Rope Co., St. Louis
Leschen, A., & Sons Rope Co., St. Louis

TRANSFER TABLES
Whiting Corp., Harvey, Ill.

TRAPS—Steam and Radiator
Strong, Carlisle & Hammond Co., Cleve.

TROLLEYS
Conco Crane & Eng. Wks. Div. of H. D. Conkey & Co., 36 S. Jefferson St., Mendota, Ill.
Hanna Engineering Works, Chicago.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., Harvey, Ill.
Yale & Towne Mfg. Co., Stamford, Ct.

TROLLEYS—Monorail
American MonoRail Co., The, Cleveland.

TRUCKS—Charging
Whiting Corp., Harvey, Ill.

TRUCKS—Dump (Power)
Crescent Truck Co., Lebanon, Pa.

TRUCKS—Elevating (Power)
Automatic Transportation Co., Inc., Buffalo, N. Y.
Crescent Truck Co., Lebanon, Pa.
Wright-Hibbard Industrial Elec. Truck Co., Inc., Phelps, N. Y.
Yale & Towne Mfg. Co., Stamford, Ct.

TRUCKS—Lift (Hand)
Lewis-Shepard Co., 123 Walnut St., Watertown Station, Boston.
Yale & Towne Mfg. Co., Stamford, Ct.

TRUCKS—Steel Shop
American Pulley Co., Philadelphia
Lansing (Mich.) Co.

TRUCKS—Two Wheel Hand
American Pulley Co., Philadelphia

TRUCKS, TRACTORS AND TRAILERS—Industrial
Atlas Car & Mfg. Co., Cleve.
Automatic Transportation Co., Inc., Buffalo, N. Y.
Chase Fdry. & Mfg. Co., Columbus, O.
Crescent Truck Co., Lebanon, Pa.
Lansing (Mich.) Co.
Wright-Hibbard Industrial Elec. Truck Co., Inc., Phelps, N. Y.
Yale & Towne Mfg. Co., Stamford, Ct.

TUBE FORMING MACHINES
Yoder Co., The, Cleveland.

TUBE MILL MACHINERY
Aetna-Standard Eng. Co., Youngstown, O.
Treadwell Engineering Co., Easton, Pa.
United Engrg. & Fdry. Co., Ptgh.

TUBES—Boiler
Allegheny Steel Co., Brackenridge, Pa.
Babcock & Wilcox Tube Co., The, 85 Liberty St., N. Y. C.
Gilberson, E. D., & Co., Inc., 40 Rector St., N. Y. C.
Keating, E. F., Co., 453 Water St., N. Y. C.
National Tube Co., Pittsburgh.
Ryerson, Jos. T., & Son, Inc., Chicago.
Tyler Tube & Pipe Co., The, Washington, Pa.

TUBES—Boiler, Charcoal Iron
Bethlehem (Pa.) Steel Co.
Keating, E. F., Co., 453 Water St., N. Y.
Reading (Pa.) Iron Co.
Tyler Tube & Pipe Co., Washington, Pa.

TUBES—Nickel Silver
Summerill Tubing Co., Bridgeport, Montgomery County, Pa.

TUBING—Aluminum, Seamless
Summerill Tubing Co., Bridgeport, Montgomery County, Pa.

TUBING—Brass, Bronze, Copper or Nickel Silver
Service Steel Co., Detroit.
Summerill Tubing Co., Bridgeport, Montgomery County, Pa.
Wolverine Tube Co., Detroit.

TUBING—Chrome Alloy
Babcock & Wilcox Tube Co., The, 85 Liberty St., N. Y. C.
Delaware Seamless Tube Co., The, Auburn, Pa.

TUBING—Cylinder Finish
Delaware Seamless Tube Co., The, Auburn, Pa.

TUBING—Open Seam
Michigan Steel Tube Prods. Co., Detroit.

TUBING—Phosphor Bronze
Phosphor Bronze Smelting Co., Phila.

TUBING—Seamless Iron
Babcock & Wilcox Tube Co., The, 85 Liberty St., N. Y. C.

TUBING—Seamless Steel
Babcock & Wilcox Tube Co., The, 85 Liberty St., N. Y. C.
Cleveland (O.) Tool & Supply Co.
Delaware Seamless Tube Co., The, Auburn, Pa.
Gilberson, E. D., & Co., Inc., 40 Rector St., N. Y. C.
Jones & Laughlin Steel Corp., Ptgh.
Keating, E. F., Co., 453 Water St., N. Y. C.
National Tube Co., Pittsburgh.
Service Steel Co., Detroit.
Summerill Tubing Co., Bridgeport, Montgomery County, Pa.
Timken Roller Bearing Co., Canton, Ohio.

TUBING—Square and Rectangular
National Tube Co., Pittsburgh.
Service Steel Co., Detroit.
Summerill Tubing Co., Bridgeport, Montgomery County, Pa.

TUBING—Welded Steel
Michigan Steel Tube Prods. Co., Detroit.
National Tube Co., Pittsburgh.
Service Steel Co., Detroit.
Tyler Tube & Pipe Co., The, Washington, Pa.

TUBING MACHINERY—Brazed
Etna Machine Co., The, Toledo

TUBULAR PRODUCTS
Cleveland (O.) Tool & Supply Co.
Michigan Steel Tube Products Co., Detroit.
Service Steel Co., Detroit.

TUMBLING BARRELS
Baird Machine Co., Bridgeport, Ct.
Globe Mach. & Stpg. Co., Cleve.
Ransohoff, N., Inc., Cinn., Ohio.
Royersford (Pa.) Fdry. & Mch. Co., Inc.
Sly, W. W., Mfg. Co., Cleveland, O.
Whiting Corp., Harvey, Ill.

TURBINES
De Laval Steam Turbine Co., Trenton, N. J.

TURNBUCKLES
Laughlin, Thomas, Co., The, Portland, Me.
Merrill Bros., Maspeth, N. Y.

TURNTABLES
Canton (O.) Fdry. & Mch. Co.
Whiting Corp., Harvey, Ill.

TWIST DRILLS
Cleveland (O.) Twist Drill Co.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Union Twist Drill Co., Athol, Mass.

TYPE—Steel
Noble & Westbrook Mfg. Co., Hartford, Ct.

UNIONS
Dart, E. M., Mfg. Co., Prov., R. I.

VALVES—Air Operating
Galland-Henning Mfg. Co., Milwaukee.
Westinghouse Traction Brake Co., Wilmerding, Pa.

VALVES—Gas and Air Reversing
Blaw-Knox Co., Ptgh.
Swindell, W., & Bros., Box 1753, Ptgh.

VALVES—Gas, Water and Steam
Wood, R. D., & Co., Philadelphia.

VALVES—Hydraulic
Anker Engng. Co., Phila.
Birdsboro (Pa.) Steel Fdry. & Mch. Co.
Galland-Henning Mfg. Co., Milwaukee.
Hydraulic Press Mfg. Co., The, Columbus, Ohio.
Watson-Stillman Co., The, 71 West St., N. Y. C.
Wood, R. D., & Co., Philadelphia.

VALVES—(Pressure Seated) Pneumatic
Cleveland (O.) Pneumatic Tool Co., The

VISES—Machine, Compensating
Avey Drilling Mch. Co., Cincinnati, O.

WASHERS—Gas
Brassert, H. A., & Co., Chicago.

WASHERS—Iron or Steel
Bethlehem (Pa.) Steel Co.
Griffin Mfg. Co., Erie, Pa.
Hager, C., & Sons Hinge Mfg. Co., St. Louis, Mo.
Joliet (Ill.) Wrought Washer Co.
Nicetown Plate Washer Co., Inc., Phila.
Oliver Iron & Steel Corp., Ptgh.
Smith, Thomas, Co., 230 Grove St. Worcester, Mass.
Wrought Washer Mfg. Co., Milwaukee.

WASHERS—Leather
Chicago (Ill.) Rawhide Mfg. Co., 1318 Elston Ave.

WASHERS—Spring Steel
Dunbar Bros. Co., Bristol, Ct.

WASHERS—Tempered
Barnes, Wallace, Co., The, Bristol, Ct.

WASHING MACHINES—For Metal Parts
Detroit (Mich.), Sheet Metal Wks.
Meaker Co., The, Chicago.
Ransohoff, N., Inc., Cinn., Ohio.

WATER-COOLED EQUIPMENT FOR OPEN-HEARTH FURNACES
Blaw-Knox Co., Ptgh.

WATER SOFTENERS AND PURIFIERS
Scaife, Wm. B., & Sons Co., Ptgh.

WELDING—Electric
Agnew Elec. Welder Co., Milford, Mich.
Blaw-Knox Co., Pittsburgh
Federal Mch. & Welder Co., Warren, O.
Thomson-Gibb Electric Welding Co., 661 Pleasant St., Lynn, Mass.

WELDING—Forge & Hammer
Blaw-Knox Co., Pittsburgh

WELDING—Oxy-Acetylene
Blaw-Knox Co., Pittsburgh
Harris Calorific Co., Cleveland.
Weldit Acetylene Co., Detroit.

WELDING AND CUTTING MACHINES AND EQUIPMENT—Oxy-Acetylene
Air Reduction Sales Co., 342 Madison Ave., N. Y. C.
Harris Calorific Co., Cleveland.
International Oxygen Co., Newark, N. J.
Oxweld Acetylene Co., 30 E. 42nd St., N. Y. C.
Weldit Acetylene Co., Detroit.

WELDING MACHINES—Butt
Agnew Elec. Welder Co., Milford, Mich.
Federal Mch. & Welder Co., Warren, O.
Swift Electric Welder Co., Blvd Temple Bldg., West Grand Blvd. at 12th St., Detroit
Taylor-Winfield Corp., The, Warren, O.
Thomson-Gibb Electric Welding Co., 661 Pleasant St., Lynn, Mass.

WELDING MACHINES—Electric Arc
Lincoln Electric Co., Cleveland.

WELDING MACHINES—(Electric Arc), Second-Hand
Goodman Elec. Mchry. Co., Newark, N. J.
Service Co., Cleveland, Ohio.

WELDING MACHINES—Seam
Federal Mch. & Welder Co., Warren, O.
Taylor-Winfield Corp., The, Warren, O.

WELDING MACHINES—Spot
Agnew Elec. Welder Co., Milford, Mich.
Federal Mch. & Welder Co., Warren, O.
Swift Electric Welder Co., Blvd Temple Bldg., West Grand Blvd. at 12th St., Detroit
Thomson-Gibb Electric Welding Co., 661 Pleasant St., Lynn, Mass.

WELDING MACHINES—(Spot), Second Hand
Taylor-Hall Welding Corp., 5 May St., Worcester, Mass.

WHEELS—Rolled Steel
Bethlehem (Pa.) Steel Co.
Carnegie Steel Co., Ptgh.

WIRE—Barb
Bethlehem (Pa.) Steel Co.
Jones & Laughlin Steel Corp., Ptgh.

WIRE—Brass, Bronze, Copper, Nickel Silver or Phosphor Bronze
Michigan Wire Cloth Co., 2117 Howard St., Detroit.
Phosphor Bronze Smelting Co., Phila.
Seymour (Ct.) Mfg. Co.

WIRE—Flat, Round, Square or Special Shapes
Hartshorn, Stewart, Co., 250 Fifth Ave., N. Y. C.
Page Steel & Wire Co., Bridgeport, Ct.
Prentiss, Geo. W., & Co., Holyoke, Mass.
Roebling's, John A., Sons Co., Trenton, N. J.
Washburn Wire Co., Inc., 118th St. & Harlem River, N. Y. C.
Webb Wire Works, New Brunswick, N. J.
Wickwire Bros., Cortland, N. Y.
Wickwire Spencer Steel Co., 41 E. 42nd, N. Y. C.

WIRE—Netting
Bethlehem (Pa.) Steel Co.
Cleveland (O.) Wire Cloth & Mfg. Co.
Wickwire Brothers, Cortland, N. Y.

WIRE—Piano and Music
New England High Carbon Wire Co., Worcester, Mass.
Washburn Wire Co., Inc., 118th St. and Harlem River, N. Y. C.
Webb Wire Works, New Brunswick, N. J.
Wickwire Spencer Steel Co., 41 E. 42nd, N. Y. C.

WIRE—Rubber Covered
Hazard Wire Rope Co., Wilkes-Barre, Pa.

WIRE—Special Drawn Shapes
Rathbone, A. B., & J. Palmer, Mass.

WIRE—Spoke and Crimping
Prentiss, Geo. W., & Co., Holyoke, Mass.

WIRE—Spring Steel
Barnes, Wallace Co., The, Bristol, Ct.
Bethlehem (Pa.) Steel Co.
Hartshorn, Stewart, Co., 250 5th Ave., N. Y. C.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corp., Ptgh.
New England High Carbon Wire Co., Worcester, Mass.
Wickwire Spencer Steel Co., 41 E. 42nd St., N. Y. C.

WIRE—Steel
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Wheeling (W. Va.) Steel Corp.

WIRE—Welding
Lincoln Electric Co., Cleveland.
Oxweld Acetylene Co., 30 E. 42nd St., N. Y. C.
Roebling's, John A., Sons Co., Trenton, N. J.
Ryerson, Jos. T., & Son, Inc., Chicago.
Wickwire Spencer Steel Co., 41 E. 42nd St., N. Y. C.

WIRE CLOTH
Buffalo (N. Y.) Wire Works Co., Inc.
Cleveland (O.) Wire Cloth & Mfg. Co.
Michigan Wire Cloth Co., 2117 Howard St., Detroit.
Wickwire Bros., Cortland, N. Y.
Wickwire Spencer Steel Co., 41 E. 42nd, N. Y. C.

WIRE COILING AND SPIRALLING MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

WIRE DRAWING MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machry. Co., Cuyahoga Falls, O.
Waterbury (Ct.) Farrel Fdry. & Mch. Co.

WIRE FORMING
Amer. Spiral Spring & Mfg. Co., Pigh
American Spring & Mfg. Corp., Holley, Mich.
Buffalo (N. Y.) Wire Works Co., Inc.
Cleveland (O.) Wire Spring Co.
Cuyahoga Spring Co., Cleveland
Fischer, Chas., Spring Co., 242 Kent Ave., Brooklyn, N. Y.
Hindley Mfg. Co., valley Falls, R. I.
Wickwire Bros., Cortland, N. Y.

WIRE FORMING MACHINERY
Baird Machine Co., Bridgeport, Ct.
Manville, E. J., Mach. Co., Waterbury, Ct.
Nilson, A. H., Mach. Co., Bridgeport, Ct.
Sleeper & Hartley, Inc., Worcester, Mass.

WIRE MILL MACHINERY AND EQUIPMENT
Shuster, F. B., Co., New Haven, Ct.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Mchry. Co., Cuyahoga Falls, O.

WIRE NAIL MACHINERY
National Mchry. Co., Tiffin, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Sleeper & Hartley, Inc., Worcester, Mass.

WIRE ROPE
Broderick & Bascom Rope Co., St. Louis.
Hazard Wire Rope Co., Wilkes-Barre, Pa.
Leschen, A., & Sons Rope Co., St. Louis.
Roebling's, John A., Sons Co., Trenton, N.J.
Wickwire Spencer Steel Co., 41 E. 42nd St., N. Y. C.

WIRE ROPE FITTINGS
Laughlin, Thomas, Co., The, Portland, Me.
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE STRAIGHTENING AND CUTTING MACHINERY—Automatic
Franklin Mfg. Co., New Haven, Ct.
Lewis Mch. Co., The, Cleveland, Ohio.
Nilson, A. H., Mch. Co., Bridgeport, Ct.
Shuster, F. B., Co., New Haven, Ct.

WIRE STRANDING AND CLOSING MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.

WOOD BLOCK FLOORING—See Flooring—Creosoted Wood

WOOD-WORKING MACHINERY
Crescent Machine Co., Leetonia, O.
Osborne & Seaton Machry. Co., Columbus, O.
Sidney (Ohio) Mch. Tool Co.

WORK EJECTORS—Air Operated
Logansport (Ind.) Mch. Co.

WORK STANDS FOR DIE BLOCKS
Tomkins-Johnson Co., Jackson, Mich.

WRENCHES
Armstrong Bros. Tool Co., Chicago.
Billings & Spencer Co., Hartford, Conn.
Cleveland (O.) Punch & Shear Wks. Co.
Drop Forging Co. of N. Y., Jersey City.
Indianapolis (Ind.) Drop Forging Co.
Williams, J. H., & Co., Buffalo, N. Y.

ZINC—Cold Rolled Strips
Hegeler Zinc Co., Danville, Ill.
Platt Bros. & Co., The, Waterbury, Ct.

ZINC—Slab (Spelter)
Erdle Perforating Co., Rochester, N. Y.
Hegeler Zinc Co., Danville, Ill.
New Jersey Zinc Sales Co., Inc., 160 Front St., N. Y. C.

ALL THESE COMPANIES CARRY AN AD IN THIS ISSUE
ALPHABETICAL INDEX . . . . PAGES 240-242

Advertisers Index

A

Abbott Ball Co.....118
Abendroth & Root Mfg. Co....158
Abrasive Mch. Tool Co..... 68
Acme Equipment Co., Inc.....220
Acme Machinery Co.....143
Acme Mch. Tool Co..... 60
Acme Steel Co.....155
Acme Stpg. & Mfg. Co.....224
Adams Co., The.....138
Adams, Ogden R.....217
Adriance Mach. Works, Inc..... 81
Aetna-Standard Eng. Co. 122
Agnew Electric Welder Co..... 94
Air Reduction Sales Co..... 93
Air-Tight Steel Tank Co.....144
Airplane Spring Co.....194
Ajax Flexible Coupling Co.....126
Akron Gear & Engr. Co.....132
Akron-Selle Co., The.....178
Alan Wood Steel Co.....149, 208
Albert & Davidson Pipe Corp...220
Albert Pipe Supply Co., Inc....220
Allegheny Steel Co.....156
Allen, Edgar, Steel Co., Inc....154
Allen, John F., Co..... 88
Allen Mfg. Co., The.....184
Alliance Mach. Co., The.....107
Allis-Chalmers Mfg. Co.....202
American Broach & Mach. Co... 62
American Cement Tile Mfg. Co..144
American Chemical Paint Co....195
American Crane Co., Inc.....102
American Crusher & Machinery Corp. 210
American Electric Furnace Co...196
American Engineering Co.....110
American Fluid Motors Co..... 84
American Forge Co..... 21
American Forging & Socket Co..178
American Foundry Equip. Co...116
American Foundrymen's Ass'n. 120-121
American Gas Furnace Co.....202
American Manganese Bronze Co..160
American MonoRail Co., The..108
American Pipe Bending Mch. Co.. 89
American Pressed Steel Co.....208
American Pulley Co.....180
American Pulverizer Co.....209
American Spiral Spring & Mfg. Co. 194
American Spring & Mfg. Corp...195
American Steel Foundries..170, 172
American-Terry-Derrick Co.....116
American Tool Works Co..... 65
Ames, W., & Co.....186
Andrews Steel Co.....151
Angle Steel Stool Co.....210
Anker Engineering Co.....206
Anthony Co. 196
Apex Tool Co., Inc., The..... 74
Arcade Mfg. Co.....116
Archer & Baldwin, Inc.....220
Armel, James P. 220
Armington Engrg. Co.....104
Armstrong-Blum Mfg. Co..... 72
Armstrong Bros. Tool Co..... 52
Athenia Steel Co., The.....152
Atkins, E. C., & Co..... 75
Atlas Brass Fdry. Co. 225
Atlas Car & Mfg. Co.....116
Atlas Drop Forge Co.....169
Atlas Steel Casting Co.....170
Auburn Ball Bearing Co. 180
Austin Co., The.....144
Automatic Transportation Co., Inc. 113
Avey Drilling Mch. Co..... 62

B

Babcock & Wilcox Co., The.....202
Babcock & Wilcox Tube Co., The 159
Baird Machine Co..... 57
Baker Bros., Inc..... 60
Baker, J. E., Co.....165
Bantam Ball Bearing Co.....180
Barber-Colman Co..... 65
Barbour-Stockwell Co. 138
Bardons & Oliver..... 72
Barnes Drill Co., Inc..... 65
Barnes-Gibson-Raymond, Inc. ... 20
Barnes, W. F. & John, Co..... 62
Barnes, Wallace, Co., The..... 19
Bartlett, C. O., & Snow Co.....116
Bascom & Co.....225
Bay City Forge Co.....166
Beardsley & Piper Co.....116
Beatty Mch. & Mfg. Co....88, 221
Bedford Fdry. & Mch. Co..... 104
Behringer, E., Sheet Metal Wks., Inc. 224
Belden Machine Co..... 168
Bell, David Co., Inc., The.....182
Belmont Iron Works.....146
Belyea Co., Inc.....219
Bennett Mchry. Co.....216
Bernstein, George M., & Co....216
Bertsch & Co..... 86
Best, W. N., Corp.....196
Bethlehem Steel Co..... 7
Bignall & Keeler Mach. Works.. 71
Billings & Spencer Co..... 46
Birdsboro Steel Fdry. & Mch. Co.. 80
Bixby, R. W., Inc.....228
Blanchard Mach. Co., The..... 68
Blaw-Knox Co. 119
Bliss, E. W., Co..... 79
Bliss & Laughlin, Inc.....152
Booth Felt Co., Inc., The.....206
Bossert Corp.....177
Boston Gear Works Sales Co....135
Botwinik Bros., Inc.....212, 219
Box Crane & Hoist Corp.....103
Boyle, John, Jr.....226
Brandt Mchry. Co.....217
Brassert, H. A., & Co.....146
Breese Bros. Co.....178
Bridgeport Brass Co.....174
Bridgeport Safety Emery Wheel Co., Inc., The..... 68
Bristol Co., The.....202
Broderick & Bascom Rope Co....192
Brosius, Edgar E., Inc.....100
Brown & Sharpe Mfg. Co..... 60
Brownell Mchry. Co. 216
Browning Crane Co.....109
Brubaker, W. L., & Bros. Co.... 74
Buckeye Brass & Mfg. Co..... 182
Buffalo Bolt Co..... 186
Buffalo Bronze Die Cast Corp 183, 225
Buffalo Forge Co..... 16
Buffalo Mch. Key Co.....190
Buffalo Wire Wks. Co., Inc.....191
Bullard Co., The..... 47
Burden Iron Co., The.....150
Burgess-Norton Mfg. Co.....224
Bury Compressor Co.....206
Business Opportunities Section..226

C

Cadman, A. W., Mfg. Co..... 225
Calder, Geo. H..... 75
Caldwell, W. E., Co.....142
Cann & Saul Steel Co.....168
Canton Forge & Axle Co.....169
Canton Fdry. & Mch. Co.....104
Cape May Sand Co.....116
Carborundum Co., The.....198-199
Carnegie Steel Co.....208
Carroll Chain Co.....126
Cattie Bros. Corp.....225
Cattie, Joseph P., & Bros.....225
Cavagnaro, John J.....223
Central Alloy Steel Corp..... 17
Central Iron & Steel Co.....208
Century Wood Preserving Co....209
Chambersburg Engrg. Co.....138
Champion Blower & Forge Co....196
Champion Mach. & Forging Co..169
Chase Fdry. & Mfg. Co.....116
Chateaugay Ore & Iron Co. 162
Chicago Bridge & Iron Wks.....144
Chicago Perforating Co. 180
Chicago Pneumatic Tool Co..... 77
Chicago Rawhide Mfg. Co.....138
Cincinnati Bickford Tool Co..... 48
Cincinnati Electrical Tool Co., The 68
Cincinnati Lathe & Tool Co..... 62
Cincinnati Planer Co., The..... 66
Cincinnati Shaper Co..... 13
Cincinnati Steel Castings Co.....170
Clapp, E. D., Mfg. Co., The....168
Clark Bros. Bolt Co.....187
Clark Controller Co.....138
Clearing House Section.....211-221
Cleveland Cap Screw Co.....182
Cleveland-Cliffs Iron Co.....164
Cleveland Crane & Engrg. Co...104
Cleveland Electric Tramrail....104
Cleveland Hardware Co.....165
Cleveland Planer Co..... 68
Cleveland Pneumatic Tool Co., The 76
Cleveland Punch & Shear Wks. Co. 6
Cleveland Quarries Co..... 68
Cleveland Tool & Supply Co.....158
Cleveland Twist Drill Co..... 9
Cleveland Wire Cloth & Mfg. Co.191
Cleveland Wire Spring Co.....192
Cleveland Worm & Gear Co.....126
Clifton Mchry. Co.....219
Clingerman, G. F., Mfg. Co.....223
Cochrane-Bly Co. 72
Cohen, Louis, & Son.....221
Cold Metal Process Co., The....156
Cole, R. D., Mfg. Co.....142
Colebrookdale Iron Co.....225
Columbia Electric Mfg. Co.....195
Columbia Tool Steel Co.....154
Commercial Steel Casting Co., The 171
Conco Crane & Engrg. Wks. Div. of H. D. Conkey & Co.....107
Cone Automatic Mach. Co., Inc. 65
Connecticut Fdry. Co., The.....225
Consolidated Mach. Tool Corp. of America 50-51
Continental Felt Co.....206
Continental Iron & Steel Co.....221
Contract Work Section.....223-225
Cook, Asa S., Co..... 94
Cook, H. C., Co.....224
Cook Spring Div. of Barnes-Gibson-Raymond, Inc. 20
Coppus Engng. Corp.....210
Corbin Screw Corp.....185
Cowdrey, C. H., Mach. Co.....223
Craig, Thomas H., Jr.....216
Crescent Mch. Co..... 72
Crescent Truck Co.....114
Cross Engineering Co.....180
Crucible Steel Casting Co., Ohio.170
Crucible Steel Castings Co., Pa..170
Cumberland Steel Co.....152
Curtis & Curtis Co. 70
Cuyahoga Spring Co.....192

D

Dake Engine Co.....202
Dart, E. M., Mfg. Co.....206
Darwin & Milner, Inc.....156
Davenport Locomotive & Mfg. Corp. 170
Davis Brake Beam Co.....224
Davis, Robert Warren.....216
Defiance Mch. Wks..... 66
De Laval Steam Turbine Co. 202
Delaware Seamless Tube Co.....158
Delta Equip. Co.....218
Denny, W. I.....216, 217
Detroit Electric Furnace Co.....196
Detroit Hoist & Mch. Co.....108
Detroit Metal Specialty Corp....180
Detroit Sheet Metal Works.....210
Dickinson, Thos. L..... 76
Dings Magnetic Separator Co....122
Disston, Henry, & Sons, Inc....152
Divine Bros. Co..... 75
Doelger & Kirsten..... 84
Donner Steel Co., Inc..... 12
Dony, D. E.....216
Dreis & Krump Mfg. Co. 88
Driver-Harris Co. 150
Drop Forging Co. of New York.169
Drying Systems, Inc.....202
Duff Patents Co., Inc.....146
Dunbar Bros. Co..... 20
Dundore Mfg. Co.....126
Duquesne Steel Fdry. Co.....122

E

Earle Gear & Mach. Co.....132
Eastern Machine Screw Corp.... 56
Eastern Mchry. Co.....214
Eastern Rolling Mill Co., The..156
Eastern Tool & Stpg. Co., Inc..224
Economy Engng. Co., The..... 70
Economy Furnace Co.....196
Edge Hill Silica Rock Co.....165
Edgewater Steel Co.....166
Electric Controller & Mfg. Co...108
Electric Furnace Co.....196
Elmes, Chas. F., Engng. Wks... 80
Empire Steel Corp. 42-43
Employment Exchange 227-228
Erdle Perforating Co.....180
Erie Bronze Co.....174
Erie Forge Co.....166
Erie Foundry Co.....140
Espen-Lucas Mach. Works, The. 72
Essley, E. L., Mchry. Co.....217
Etna Machine Co., The.....100
Euclid Crane & Hoist Co., The.104
Excelsior Tool & Mch. Co..... 88
Eyster, Weiser Co.....225

F

Fafnir Bearing Co.....246
Fabricated Steel Prods. Co.....223
Falls Clutch & Mchry. Co., The.126
Farrel-Birmingham Co., Inc.....125
Farrell-Cheek Steel Fdry. Co.... 23
Federal Cement Tile Co..... 8
Federal Mch. & Welder Co..... 95
Felters Co., Inc., The.....206
Ferguson Gear Co.....132
Ferracute Machine Co..... 80
Firm Purchasing Corp.....217
Firth-Sterling Steel Co.....154
Fischer, Charles, Spring Co.....194

Advertisers Index

Foote Bros. Gear & Mch. Co....133
Ford, J. B., Co.....37
Ford Motor Co.....163
Forest City-Walworth Run Fdries. Co.....172
Frank, M. K.....221
Franklin Mch. Co.....223
Fort Pitt Malleable Iron Co.....172
Foster, Frank B.....226
Franklin Mfg. Co.....100
Fredericksen Co.....181
French Oil Mill Mchry. Co.....84
Frog Switch & Mfg. Co., The...170

G

Galland-Henning Mfg. Co.....204
Gardner Machine Co.....70
Gears & Forgings, Inc.....130
Gehnrich Oven Co., Inc.....197
General Drop Forge Co.....170
General Electric Vapor Lamp Co.....53-54
General Machine Works.....223
General Mch. & Mfg. Co.....224
General Mchry. Corp.....216
General Refractories Co.....165
Geometric Tool Co., The.....75
Geuder, Paeschke & Frey Co....175
Giberson, E. D., & Co., Inc.....158
Gibson, Wm. D., Co.....20
Globe Mch. & Stpg. Co.....178
Globe Wire Co.....154
Goodman Electric Mchry. Co...220
Gould & Eberhardt.....66
Grand Rapids Hardware Co....218
Grant Gear Works.....138
Gray, G. A., Co.....68
Great Lakes Pressed Steel Corp..224
Greenpoint Iron & Pipe Co., Inc.220
Griffin Mfg. Co.....158
Gross Lead Burning & Coating Corp.....142

H

Hagan, George J., Co.....196
Hager, C., & Sons Hinge Mfg. Co.....180
Haines Gauge Co.....122
Hallden Machine Co.....97
Hammond Mchry. Builders, Inc..68
Hanna Engr. Works.....80, 108
Hanna Furnace Co., The.....162
Harbison-Walker Refractories Co.164
Hardie-Tynes Mfg. Co.....225
Harnischfeger Corp.....40, 108
Harrington Co., The.....108
Harrington & King Perforating Co.....179
Harris Bros. Co.....214
Harris Calorific Co.....91
Harrison, H. H., Co.....228
Harsch, John, Bronze & Fdry. Co., The.....173
Hartford Machine Screw Co.....225
Hartford Special Mchry. Co., The.....132, 223
Hartshorn, Stewart, Co.....190
Hauck Mfg. Co.....195
Hauser-Stander Tank Co.....144
Hawkridge Bros. Co.....152
Hayward Co., The.....101
Hazard Wire Rope Co.....193
Hegeler Zinc Co.....162
Heller Bros. Co.....154
Helwig Mfg. Co.....76
Hendey Machine Co.....29
Hendley & Whittemore Co.....89
Hendrick Mfg. Co.....206
Henry Forge & Tool, Inc.....169
Heppenstall Co.....165
Herman Pneumatic Mch. Co....116
Hevi Duty Electric Co.....197
Highway Truck Parts Co.....217
Hill, Clarke & Co. of Chicago 58, 211
Hill Clutch Mch. & Fdry. Co., The.....223
Hilliard Corp., The.....126
Hillman Coal & Coke Co.....164
Hindley Gear Co.....132
Hindley Mfg. Co.....192
Hisey-Wolf Mch. Co.....70
Hitner's, Henry A., Sons Co....220
Hoggson & Pettis Mfg. Co., The.210
Holcroft & Co.....197
Horsburgh & Scott Co.....131
Hoskins Mfg. Co.....196
Hubbard, M. D., Spring Co.....194
Hudson Pipe & Supply Co.....220
Huebel Mfg. Co., Inc.....224
Hunter Pressed Steel Co.....194
Hurlbut Rogers Mchry. Co.....72
Hyde Park Fdry. & Mach. Co...122
Hydraulic Press Mfg. Co., The..83
Hyman, Joseph, & Sons.....215
Hyman-Michaels Co.....221

I

Ideal Mchry. Co.....218
Illinois Steel Warehouse Co.....151
Independent Pneumatic Tool Co..76
Indianapolis Drop Forging Co...168
Industrial Brownhoist Corp.....30
Industrial Plants Corp.....213
Industrial Power & Equip. Co...219
Industrial Silica Corp.....116
Industrial Steel Casting Co.....170
Ingersoll-Rand Co.....26
Inland Steel Co.....25
International Mchry. Co.....214
International Nickel Co., Inc.....161
International Oxygen Co.....89
Interstate Iron & Steel Co.....152

J

Janney, Joseph A., Jr.....142
Jennison-Wright Co., The.....206
Jessop Steel Co.....154
Johnson Steel & Wire Co., Inc...190
Johnson, Wm. C., & Sons Mchry. Co.....216
Joliet Wrought Washer Co.....190
Jones & Lamson Mach. Co.....62
Jones & Laughlin Steel Corp.....15
Jones Mch. Tool Wks., Inc.....223
Jones, W. A., Fdry. & Mch. Co..129
Jones, Mark W.....222

K

Kaalot Mfg. Co.....75
Kane & Roach.....122
Kardong Bros., Inc.....88
Kearney & Trecker Corp.....60
Keating, E. F., Co.....158
Kelker Blower Co., Inc.....224
Keller Mechanical Engng. Corp..70
Kellogg, M. W., Co., The.....145
Kennedy, Julian.....146
Keystone Friction Hinge Co.....224
Keystone Forging Co.....168
King, Philip T.....220
Kingsbury Machine Tool Corp...65
Kline Hardware Co.....225
Konigslow, Otto, Mfg. Co., The..180
Koppers Construction Co., The..2

L

L. & D. Pipe Supply Co., Inc....220
Laclede Steel Co.....156
Lake Erie Engineering Corp.....80
Lambert & Todd Mch. Co.....223
Lamson & Sessions Co., The.....14
Lancaster Iron Works, Inc.....142
Land, L. J.....219
Landis Tool Co.....67
Langelier Mfg. Co.....99
Lansing Co.....117
Lansing Stamping Co.....178
Lapointe Mach. Tool Co.....62
Latrobe Elec. Steel Co.....156
Laughlin, Alex., & Co.....146
Laughlin, Thomas, Co., The.....192
Lavino, E. J., & Co.....165
Lebanon Boiler Wks., Inc.....226
LeBlond, R. K., Mch. Tool Co...62
Lee Spring Co., Inc.....194
Leland Electric Co., The.....138
Leland-Gifford Co.....65
Leschen, A., & Sons Rope Co.....192
Lewis Fdry. & Mch. Co.....123
Lewis Mch. Co., The.....94
Lewis-Shepard Co.....116
Liberty Mach. Tool Co.....68
Lincoln Electric Co.....92
Lindheimer, S. W., Inc.....221
Link-Belt Co.....4-5
Littell, F. J., Mch. Co.....80
Llewelyn, Thomas J., & Co.....146
Lodge & Shipley Mch. Tool Co..217
Logansport Mch. Co., The.....76
Long & Allstatter Co.....86
Love, A. C.....218
Lucas, J. L., & Son, Inc.....216
Lucas Mach. Tool Co.....60
Luers Bros. Mchry. & Tool Co...225
Lumen Bearing Co.....174
Luria Bros. & Co., Inc.....221

M

McCann-Harrison Corp.....197
McClintic-Marshall Co.....144
McCord, Joseph A.....226
McCullough-Dalzell Crucible Co..122
McKee, Arthur G., & Co. ..146, 227
MacCabe, T. B.....220
Machinery Forging Co., The.....165
Maehler, Paul, Co., Inc.....197
Magnetic Mfg. Co.....122
Malleable Iron Fittings Co.....118
Mallory Mchry. Corp.....220
Manganese Steel Forge Co.....152
Manistee Iron Works Co.....206
Manning, Maxwell & Moore, Inc. 49
Manville, E. J., Machine Co.....96
Marchant, Geo. F., Co.....76
Marine Metal & Supply Co.....220
Maris Bros., Inc.....102
Marr-Galbreath Mchry. Co.....217
Marschke Mfg. Co.....70
Marshalltown Mfg. Co.....87
Matthews Mfg. Co.....22
Maynard Elec. Steel Casting Co..172
Meaker Co.....59
Meehan Boiler & Const. Co.....144
Meeker Fdry. Co.....172
Medart Co., The.....134
Merrell Mfg. Co.....70
Merrill Bros.....168
Metal Specialty Co., The.....31
Michigan Steel Tube Prods. Co..160
Michigan Wire Cloth Co.....192
Miles Machinery Co.....217
Miller & Van Winkle, Inc.....194
Milne, A., & Co.....154
Milton Mfg. Co.....186
Milwaukee Elec. Crane & Hoist Corp.....104
Milwaukee Forge & Mch. Co....165
Minster Machine Co., The.....78
Modine Mfg. Co.....63, 64
Moloch Fdry. & Mch. Co.....142
Moltrup Steel Prods. Co.....150
Monarch Mch. Tool Co., The.....65
Morey & Co., Inc.....212
Morgan Construction Co.....219
Morgan Engineering Co., The....104
Morris Machine Works.....206
Morrison Railway Supply Corp..221
Morse Chain Co.....128
Morse Twist Drill & Mch. Co.....73
Mott Sand Blast Mfg. Co., Inc...118
Moyer, J. N.....218
Mullins Mfg. Corp.....180
Mundt, Chas., & Sons.....179
Murchey Mch. & Tool Co.....75
Muskegon Boiler Wks.....142
Myers, F. E., & Bro., Co.....203

N

Naismith, Geo., & Son.....146
National Acme Co., The.....62
National Alloy Steel Co.....170
National Engineering Co.....118
National Equip. Co.....223
National Forge & Ordnance Co..165
National Mchry. Co.....138
National Roll & Fdry. Co.....122
National Tube Co.....157
Nazel Engng. & Mch. Works....141
Neely Nut & Bolt Co.....186
New Albany Mch. Mfg. Co.....78
New Departure Mfg. Co.....44
New England High Carbon Wire Co.....191
New England Pressed Steel Co..174
New Jersey Mchry. Exchange, Inc.....214
New Jersey Zinc Sales Co., Inc..35
N. Y. Belting & Packing Co.....126
Newark Galvanizing Co.....225
Newark Malleable Iron Works...172
Newbold, R. S., & Son Co.....84
Newport Rolling Mill Co.....156
Newton Mfg. Co.....225
Newton Steel Co.....156
Niagara Mach. & Tool Works...243
Nicetown Plate Washer Co., Inc.152
Nicholls, W. H., Co., Inc.....116
Nilson, A. H., Mach. Co.....98
Noble & Westbrook Mfg. Co.....210
Norris Bros., Inc.....215
North American Refractories Co..164
North Wales Machine Co., Inc...225
Northern Engineering Wks.....24
Northern Malleable Iron Co.....172
Nute, McGehee, Geary Co., Inc..225

O

Oakite Products, Inc.....61
O'Brien Mchry. Co., Inc...218, 219
Ohio Electric & Mfg. Co.....108
Ohio Locomotive Crane Co.....108
Ohl, George A., & Co., Inc.....89
Oliver Iron & Steel Corp.....188, 189
Olson Mfg. Co.....185
Orton Crane & Shovel Co.....108
Osborn Mfg. Co., The.....116
Osborne & Sexton Mchry. Co....216
Ottemiller, Wm. H., Co., Inc....186

Advertisers Index

Owen Bucket Co., The 100
Oxweld Acetylene Co. 90

P

Page Steel & Wire Co. 192
Pangborn Corporation 118
Parish Pressed Steel Co. 176
Patent Specialty Supply Co., Inc.224
Paul, W. P., Co. 225
Payne, N. B., & Co. 100, 220
Peerless Mch. Co. 72
Pels, Henry, & Co. 38
Penn Fdry. & Mfg. Co. 225
Penn Mchry. Co. 217
Penn, Jacob, Inc. 228
Penn Jersey Metal Prods. Corp..224
Penn Screw & Mch. Works 225
Pennsylvania Engng. Wks. 146
Pennsylvania Gear & Mch. Co. ..132
Pennsylvania Pump & Compressor Co. 206
Peoria Malleable Castings Co. ...172
Perin & Marshall 146
Perry, Buxton, Doane Co., The..221
Petroleum Iron Works Co. 142
Philadelphia Gear Works 138
Philadelphia Hardware & Malleable Iron Works, Inc. 187
Philadelphia Steel & Iron Co. ...166
Phoenix Iron Co. 150
Phosphor Bronze Smelting Co... 3
Pickands, Mather & Co. 162
Pilling & Co., Inc. 164
Pipe Machinery Co. 70
Pittsburgh Elec. Furnace Corp...197
Pittsburgh Forge & Iron Co. 152
Pittsburgh Metallurgical Co., Inc.165
Pittsburgh Tool Steel Wire Co...154
Platt Bros. & Co., The 160
Plymouth Locomotive Works 116
Poole Engng. & Mach. Co. 126
Portable Machinery Co. 100
Potts, Henry, & Co. 218
Power Piping Co. 206
Pratt, William E., Mfg. Co. 225
Prentiss, Geo. W., & Co. 190
Pressed & Welded Steel Prods. Co. 224
Price, Harry D. 219
Production Mch. Co. 68
Progressive Mfg. Co. 185

Q

Quickwork Co., The (Not Incorporated — H. Collier Smith, owner) 84

R

Racine Tool & Mch. Co..... 72
Randle Machinery Co.....219
Ransohoff, N., Inc.....115
Ransom Mfg. Co..... 70
Rathbone, A. B. & J.....186
Raymond Mfg. Co..... 20
Reading Iron Co..... 34
Reed-Prentice Corp..... 65
Reed & Prince Mfg. Co.....184
Reliance Machinery Sales Co..217
Rentschler, J. P., & Co.....217
Republic Iron & Steel Co.....162
Research Corp.....147
Rhoades, R. W., Metaline Co., Inc. 182
Rhode Island Tool Co.....187
Richards, I. P. Co..... 76
Richmond Forgings Corp.....218
Richmond Malleable Castings Co.172
Riverside Mchry. Depot.....217
Rivet Cutting Gun Co..... 76
Rivett Lathe & Grinder Corp.... 75
Robbins & Myers, Inc.....108
Robertson, John, Co..... 80
Rock River Engng. Co.....85, 218
Rockford Drop Forge Co.....170
Rockford Iron Wks..... 78
Rockford Power Mchry. Co.....219
Rockwell, W. S., Co.....196
Roebling's, J. A., Sons Co.....192
Roeper Crane & Hoist Works, Inc. 108
Rogers Brown & Crocker Bros. Inc. 164
Roots, P. H. & F. M., Co.....118
Ross Power Equip. Co.....220
Ross-Tacony Crucible Co.....122
Roth Brothers & Co., Div. of Century Electric Co.....137
Royersford Fdry. & Mch. Co., Inc. 70, 225
Russell, Burdsall & Ward Bolt & Nut Co..... 36
Russell Mch. Co.....216
Ryerson, Jos. T., & Son, Inc.... 27

S

Sachsenmaier, Geo., Co.....220
Safety Grinding Wheel & Mach. Co. 69
St. Paul Corrugating Co.....224
Samuel, Frank, & Co.....165
Saunders, D., Sons, Inc..... 70
Scaife, Wm. B., & Sons Co.....142
Schollhorn, Wm., Co.....224
Schoonmaker, A. G. & Sons, Inc.219
Schwerdtle Stamp Co., The 210
Scofield, Gilbert J., Co., Inc.....223
Screw Machine Products Corp..185
Scullin Steel Co.....150
Scully-Jones & Co.....218
Segal Herbert Action & Co.....222
Seifreat-Elstad Mchry. Co.....215
Sellers, Wm., & Co., Inc..... 39
Seneca Iron & Steel Co.....156
Service Co.....218
Service Steel Co.....158
Sessions Foundry Co., The.....173
Seymour Mfg. Co., The.....160
Seymour Products Co., The....178
Shaw & Lynch, Inc.....218
Sharples Separator Co.....223
Shenango-Penn Mold Co.....152
Shepard Niles Crane & Hoist Corp. 105-106
Sherwood, E. C.....221
Shimer, Samuel J., & Sons, Inc.186
Shoemaker Bridge Co.....144
Shore Instrument & Mfg. Co., Inc. 202
Shuster, F. B., Co., The..... 96
Sidney Mch. Tool Co., The.... 65
Simmons Mch. Tool Corp.....215
Simonds Saw & Steel Co.....154
Sivyer Steel Casting Co.....10-11
Sleeper & Hartley, Inc..... 94
Sly, W. W. Mfg. Co.....118
Smith, F. P., & Co.....187
Smith, David H., & Sons, Inc.. 86
Smith, Geo. H., Steel Casting Co. 170
Smith, H. A. Mchry. Co.....218
Smith & Mills Co., The..... 66
Smith, Thomas, Co.....174
South Bend Lathe Wks..... 55
Southwark Fdry. & Mch. Co.... 82
Spencer, I. S., Sons, Inc.....172
Springfield Mfg. Co., The..... 68
Square D Co. 136, 139
Standard Appraisal Co.....226
Standard Electrical Tool Co.... 68
Standard Machinery Co.....123
Standard Pressed Steel Co.....182
Standard Shop Equip. Co.....209
Stanley Wks., The.....148, 224
Steel Plate Products Co.....142
Steiner Oven Co.....197
Steinle Turret Mach. Co....72, 216
Sterling Grinding Wheel Co.... 68
Stevens, Arthur L., Corp.....146
Stocker-Rumely-Wachs Co.....216
Stone, Francis & Hart.....209
Storms Drop Forging Co.....168
Stowe-Fuller Refractories Co., The 164
Streine Tool & Mfg. Co., The... 84
Strong, Carlisle & Hammond Co., The 182, 197
Strong Steel Fdry. Co.....170
Sullivan Machinery Co.....205
Summerill Tubing Co.....158
Superior Steel Corp.....156
Swanson Mach. Co.....223
Swift Electric Welder Co..... 89
Swindell, Wm., & Bros.....197

T

Taylor & Fenn Co., The..... 66
Taylor Forge & Pipe Wks.....158
Taylor-Hall Welding Corp.....218
Taylor Instrument Companies...201
Taylor-Wilson Mfg. Co.....122
Taylor-Winfield Corp., The..... 89
Tennessee Coal, Iron & Railroad Co. 153
Thomas Spacing Mach. Co..... 65
Thompson Grinder Co..... 68
Thomson-Gibb Electric Welding Co. 94
Timken Roller Bearing Co.....245
Tippins & Sprengle, Inc.....219
Titanium Alloy Mfg. Co.....244
Toledo Machine & Tool Co..... 78
Tomkins-Johnson Co..... 74
Torrington Co. 100
Treadwell Engineering Co.....170
Truscon Steel Co., Pressed Steel Div. 114
Turner & Seymour Mfg. Co....225
Twin Disc Clutch Co.....127
Tyler Tube & Pipe Co.....160

U

Udylite Process Co..... 18
Ultra Fuzon Distributing Co....195
Union Steel Casting Co.....122
Union Switch & Signal Co.....167
Union Twist Drill Co..... 74
United Engng. & Fdry. Co....32-33
U. S. Body & Forging Co., Inc.168
U. S. Refractories Corp.....164
Universal Boring Mach. Co..... 60

V

V & O Press Co., The..... 78
Valley Mould & Iron Corp.....150
Vanadium-Alloys Steel Co.....154
Vaughn Machinery Co., The 122
Veeder-Root, Inc.....201
Verdin, Kappes & Verdin Co.... 78
Vermilion Malleable Iron Co....172
Vitek Mfg. Co.....209

W

Walsh, J. T.....219
Walter-Wallingford & Co.....165
Wapakoneta Mch. Co..... 84
Washburn Wire Co., Inc., N. Y.191
Waterbury-Farrel Fdry. & Mch. Co. 98
Watson-Stillman Co.....85, 223
Webb, Jervis B., Co.....102
Webb Wire Works, The.....190
Weirton Steel Co.....162
Weldit Acetylene Co..... 94
Welker-Hoops Mfg. Co., The....225
West Leechburg Steel Co.....156
West Steel Casting Co., The....172
West Virginia Fire Clay Mfg. Co. 118
Western Screw Products Co....185
Western Wire Products Co.....190
Westfield Nut Co.....187
Westinghouse Traction Brake Co.207
Wetherell Bros. Co.....152
We Want to Buy Section.....222
Wheeling Steel Corp.....152
Wheelock, Lovejoy & Co., Inc.. 1
White, A. D., Mchry. Co.....217
Whiting Corp.....111-112, 223
Whitney Mfg. Co., The.....126
Whiton, D. E., Mach. Co..... 75
Wickwire Bros. 191
Wickwire Spencer Steel Co.... 41
Wilcox, D., Mfg. Co.....169
Wilkoff, Wm., Inc. 224
Williams, J. H., & Co.....169
Wilson-Maeulen Co., Inc.....202
Wolverine Tube Co.....158
Wood, R. D., & Co.....203
Woolford, G., Wood Tank Mfg. Co. 142
Worcester Pressed Steel Co....224
Worcester Stamped Metal Co..174
Wright-Hibbard Industrial Electric Truck Co., Inc.....116
Wrought Iron Co. of America..186
Wrought Washer Mfg. Co.....190

X

Xenia Fdry. & Mch. Co.....174

Y

Yale & Towne Mfg. Co..... 28
Yoder Co., The..... 86
York Corrugating Co.....178
York Fdry. & Mch. Co.....225
Young Bros. Co.....200

Z

Zeh & Hahnemann..... 78
Zelnicker in St. Louis.....221

CLASSIFIED SECTIONS

Clearing House 211-221
We Want to Buy.....222
Contract Work 223-225
Business Opportunities 226
Employment Exchange 227-228

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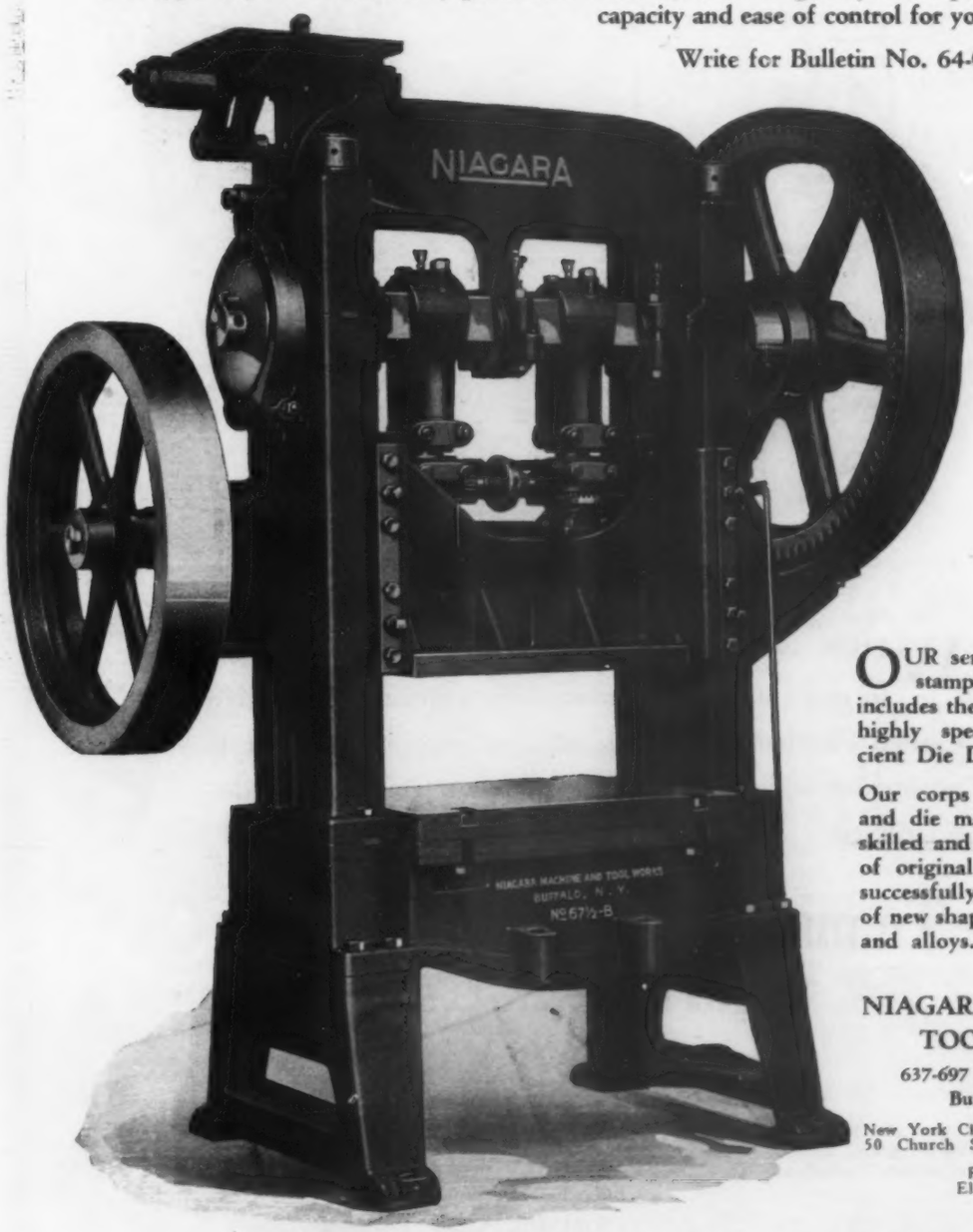

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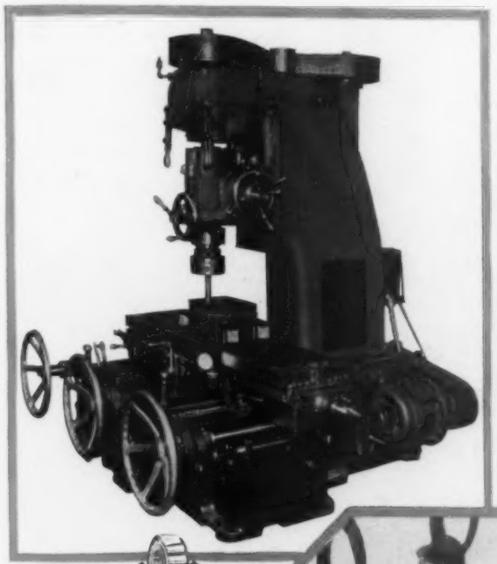

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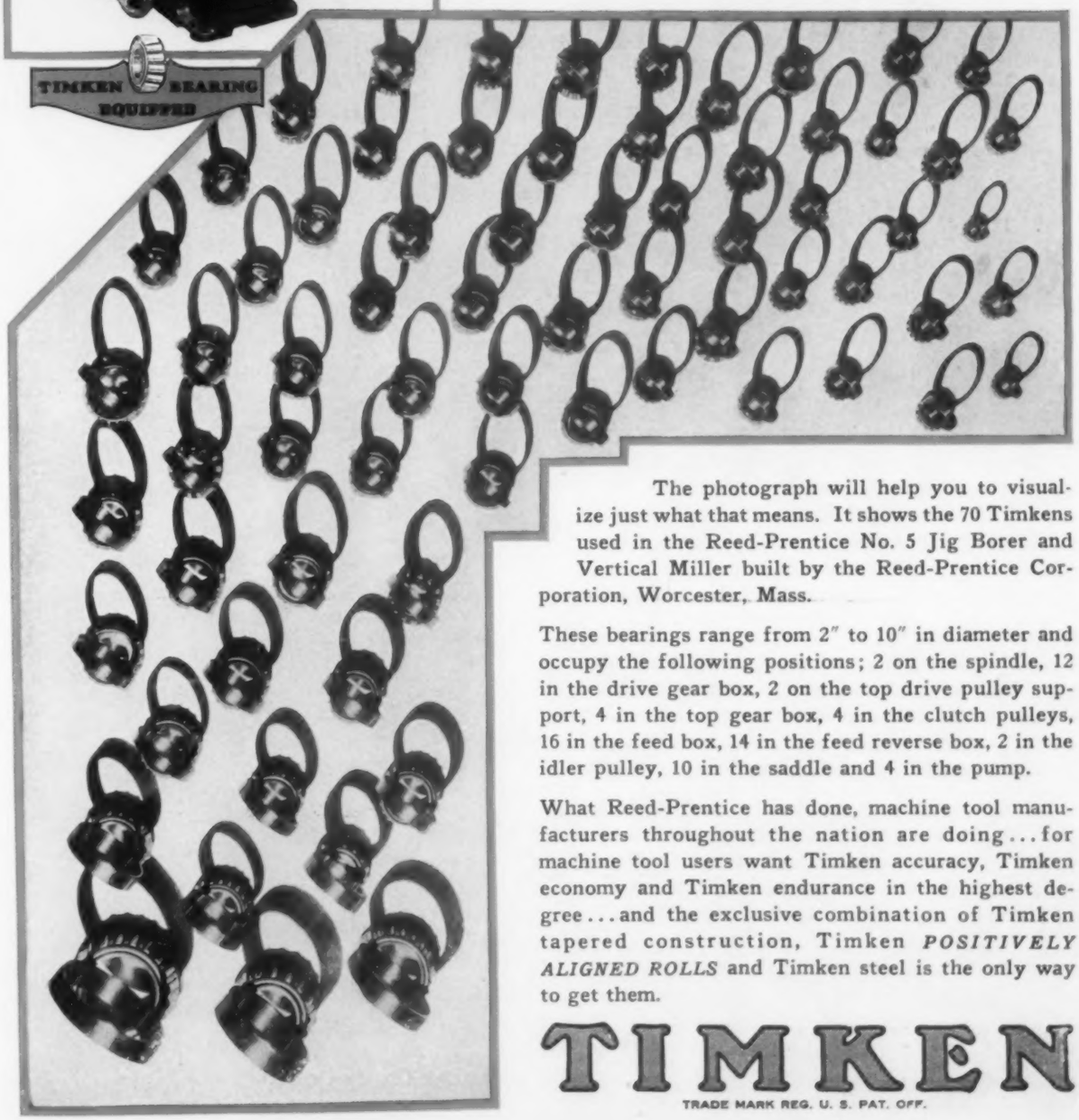

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